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(54) PRE-PROCESSING LIQUID FOR RECORDING MATERIAL AND IMAGE RECORDING METHOD

(57) Abstract:

PROBLEM TO BE SOLVED: To provide the pre-processing liquid for a recording material, by which a favorable perfecting on a plain paper is possible, and an image recording method thereon.

SOLUTION: In the image recording method, in which firstly the pre-processing liquid is given onto the surface forming an image thereon of the material to be recorded so as to discharge a coloring material-containing recording liquid in droplets in response to image signals before the drying and solidification of the pre-processing liquid in order to adhere the recording liquid to the material to be recorded for forming the image, the pre-processing liquid includes 10 to 80 wt.% of a compound, which lowers the dispersibility or solubility of the recording liquid, and has a viscosity at 25°C of 10 to 10,000 mPa.s. In addition, when an anionic recording liquid is employed, an image quality can be more improved by employing the pre-processing liquid including a specified cationic compound.

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CLAIMS**[Claim(s)]**

[Claim 1] In the image recording approach which discharge and this recording ink are made for the recording ink containing color material to adhere to a recorded material as a drop according to a picture signal, and forms an image before it gives pretreatment liquid to the recorded material front face which forms an image and this pretreatment liquid carries out desiccation solidification The image recording approach which the above-mentioned pretreatment liquid contains the compound to which the dispersibility of the above-mentioned recording ink or solubility is made to fall ten to 80% of the weight, and is characterized by the viscosity in 25 degrees C being 10 - 10000 mPa-s.

[Claim 2] The image recording approach according to claim 1 which the above-mentioned pretreatment liquid contains the compound to which the dispersibility of the color material in the above-mentioned recording ink or solubility is made to fall ten to 80% of the weight, and is characterized by the viscosity in 25 degrees C being 10 - 10000 mPa-s.

[Claim 3] The image recording approach according to claim 1 or 2 characterized by the viscosity in the above-mentioned 25 degrees C being 20 - 10000 mPa-s.

[Claim 4] The image recording approach according to claim 1 to 3 characterized by giving so that coating weight may serve as 0.5 g/m² - 10 g/m² in case the above-mentioned pretreatment liquid is given to the above-mentioned recorded material.

[Claim 5] The image recording approach according to claim 1 to 4 characterized by the contact angle of the above-mentioned recording ink to the recorded material after grant of the above-mentioned pretreatment liquid being 90 or less degrees.

[Claim 6] The image recording approach according to claim 1 to 5 that the above-mentioned aforementioned pretreatment liquid is surface tension 40 - 60 mN/m, and the above-mentioned recording ink is surface tension 20 - 40 mN/m.

[Claim 7] The image recording approach according to claim 1 to 6 characterized by giving pretreatment liquid besides the part in which the image of the above-mentioned recorded material is formed in case the above-mentioned pretreatment liquid is given to the above-mentioned recorded material.

[Claim 8] The image recording approach according to claim 1 to 7 characterized by giving pretreatment liquid to a recorded material front face with a grant means to contact a recorded material in case the above-mentioned pretreatment liquid is given to the above-mentioned recorded material.

[Claim 9] The image recording approach according to claim 8 characterized by a grant means to contact the above-mentioned recorded material being a roller.

[Claim 10] The image recording approach according to claim 8 or 9 characterized by making heat energy act on recording ink after giving pretreatment liquid to a recorded material using a grant means to contact the above-mentioned recorded material before pretreatment liquid dries.

[Claim 11] The image recording approach according to claim 1 to 10 which the above-mentioned recorded material uses pulp fiber as a principal component, and is characterized by being more than 10S and air permeability 5-50S whenever [size].

[Claim 12] The image recording approach according to claim 1 to 11 characterized by the above-mentioned recording ink containing an anionic compound and/or an anionic color material.

[Claim 13] The image recording approach according to claim 12 characterized by being at least one chosen from the group which a compound and/or an anionic color material anionic [above-mentioned] become from an anionic color, the pigment distributed with the anionic dispersant or a color, the pigment embellished with the anionic radical, and an anionic coloring particle.

[Claim 14] Pretreatment liquid of the recorded material of the colorlessness which is the pretreatment liquid used for the image recording approach according to claim 1 to 13, and contains the compound to which the solubility of

recording ink or dispersibility is made to fall ten to 80% of the weight, and is characterized by the viscosity in 25 degrees C being 10 - 10000 mPa·s, or a thin color.

[Claim 15] Pretreatment liquid of the recorded material according to claim 14 which contains the compound to which the solubility of the color material in recording ink or dispersibility is made to fall ten to 80% of the weight, and is characterized by the viscosity in 25 degrees C being 10 - 10000 mPa·s.

[Claim 16] Pretreatment liquid of the recorded material according to claim 14 or 15 characterized by the viscosity in the above-mentioned 25 degrees C being 20 - 10000 mPa·s.

[Claim 17] Pretreatment liquid of the recorded material according to claim 14 to 16 characterized by containing water five to 80% of the weight.

[Claim 18] Pretreatment liquid of the recorded material according to claim 17 characterized by containing water and a water-soluble liquefied compound 20 to 80% of the weight.

[Claim 19] Pretreatment liquid of the recorded material according to claim 18 characterized by the content of water being 40 or less % of the weight.

[Claim 20] Pretreatment liquid of the **-ed material according to claim 18 or 19 characterized by making the content of water below into the amount of equilibrium moisture in 60%RH of the water-soluble liquefied compound to contain.

[Claim 21] Pretreatment liquid of the recorded material according to claim 14 to 17 characterized by containing a water-soluble organic solvent five to 70% of the weight.

[Claim 22] Pretreatment liquid of the recorded material according to claim 14 to 21 with which the compound to which the solubility of the above-mentioned recording ink or dispersibility is made to fall is characterized by being an ionicity compound.

[Claim 23] Pretreatment liquid of the recorded material according to claim 22 characterized by the above-mentioned ionicity compound being an ionicity compound which has a with a carbon numbers of six or more alkyl group.

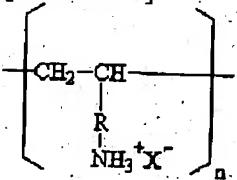
[Claim 24] Pretreatment liquid of the recorded material according to claim 23 with which the above-mentioned ionicity compound is characterized by being an ionicity high molecular compound.

[Claim 25] Pretreatment liquid of the recorded material according to claim 22 to 24 with which the above-mentioned ionicity compound is characterized by being a cationic compound.

[Claim 26] Pretreatment liquid of the recorded material according to claim 25 characterized by the above-mentioned cationic compound being a cationic high molecular compound.

[Claim 27] Pretreatment liquid of the recorded material according to claim 26 characterized by being the compound in which the above-mentioned cationic high molecular compound is shown by the bottom formula.

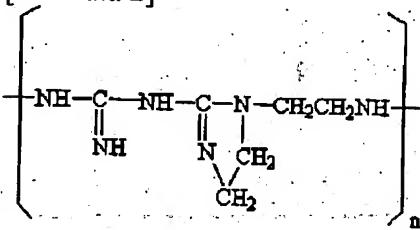
[Formula 1]



(For the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and R, the alkylenes group of carbon numbers 1-3 and n are [X-] the number of polymerizations)

[Claim 28] Pretreatment liquid of the recorded material according to claim 26 characterized by being dicyandiamide resin in which a cationic high molecular compound is shown by the bottom formula.

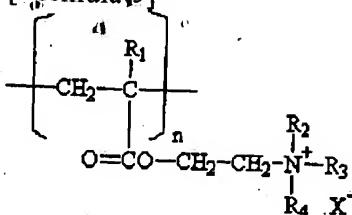
[Formula 2]



(n is the number of polymerizations)

[Claim 29] Pretreatment liquid of the recorded material according to claim 26 characterized by being the 4th class salt polymerization object of dialkyl aminoethyl (meta) acrylate in which a cationic high molecular compound is shown by the bottom formula.

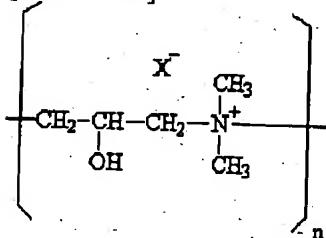
[Formula 3]



(For H, or CH₃, R₂, R₃ and R₄, H or an alkyl group, and n are [X- / the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and R₁] the number of polymerizations)

[Claim 30] Pretreatment liquid of the recorded material according to claim 26 characterized by being the cationic high molecular compound in which a cationic high molecular compound is shown by the bottom formula.

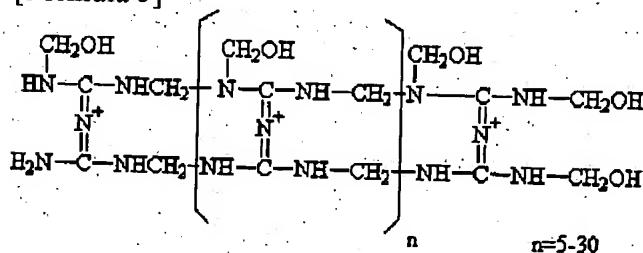
[Formula 4]



(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of polymerizations)

[Claim 31] Pretreatment liquid of the recorded material according to claim 26 characterized by being dicyandiamide resin in which a cationic high molecular compound is shown by the bottom formula.

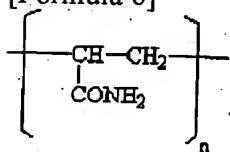
[Formula 5]



(n is the natural number of 5-30)

[Claim 32] Pretreatment liquid of the recorded material according to claim 26 characterized by being the polyacrylamide a cationic high molecular compound is indicated to be by the bottom formula.

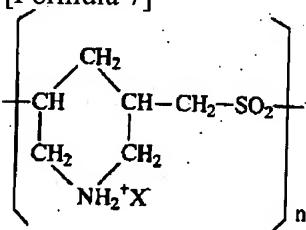
[Formula 6]



(n is the number of polymerizations)

[Claim 33] Pretreatment liquid of the recorded material according to claim 26 characterized by being the polymer in which a cationic high molecular compound is shown by the bottom formula.

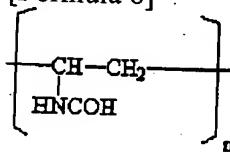
[Formula 7]



(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of polymerizations)

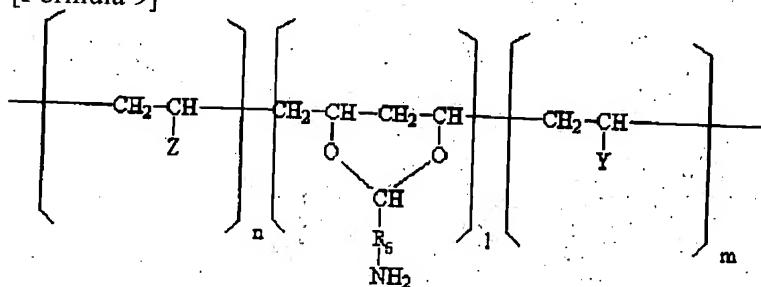
(n is the number of polymerizations)

[Claim 34] Pretreatment liquid of the recorded material according to claim 26 characterized by being the polyvinyl formamide a cationic high molecular compound is indicated to be by the bottom formula.
[Formula 8]



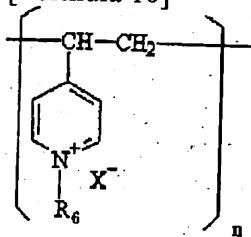
(n is the number of polymerizations)

[Claim 35] Pretreatment liquid of the recorded material according to claim 26 characterized by being the polymer in which a cationic high molecular compound is shown by the bottom formula.
[Formula 9]



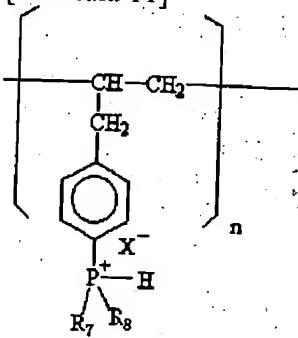
(For -OCOCH3 or -OH, and R5, the alkylene group of carbon numbers 1-4, and n, l and m are [Z and Y] the number of polymerizations, respectively)

[Claim 36] Pretreatment liquid of the recorded material according to claim 26 characterized by being the polyvinyl pyridine a cationic high molecular compound is indicated to be by the bottom formula.
[Formula 10]



(For low-grade alkyl group and X-, the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion and n are [R6] the number of polymerizations)

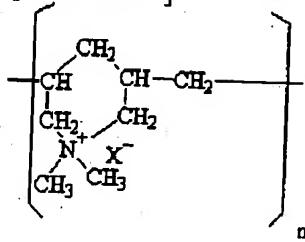
[Claim 37] Pretreatment liquid of the recorded material according to claim 26 characterized by being the polyvinylbenzyl phosphonium a cationic high molecular compound is indicated to be by the bottom formula.
[Formula 11]



(For hydrogen or low-grade alkyl group, and X-, the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion and n are [R7 and R8] the number of polymerizations)

[Claim 38] Pretreatment liquid of the recorded material according to claim 26 characterized by being the dimethyl diaryl ammonium salt polymerization object in which a cationic high molecular compound is shown by the bottom

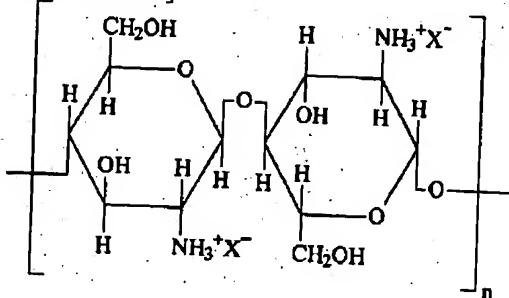
formula.
[Formula 12]



(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of polymerizations)

[Claim 39] Pretreatment liquid of the recorded material according to claim 26 characterized by being the chitosan salt a cationic high molecular compound is indicated to be by the bottom formula.

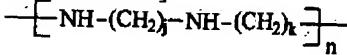
[Formula 13]



(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of polymerizations).

[Claim 40] Pretreatment liquid of the recorded material according to claim 26 characterized by being polyalkylene polyamine a cationic high molecular compound is indicated to be by the bottom formula.

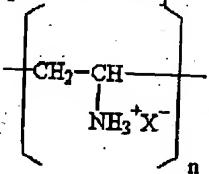
[Formula 14]



(j and k are independent respectively and the natural number of 2-6 and n are the number of polymerizations)

[Claim 41] Pretreatment liquid of the recorded material according to claim 26 characterized by being polyamine a cationic high molecular compound is indicated to be by the bottom formula.

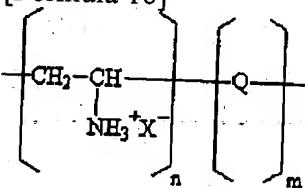
[Formula 15]



(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of polymerizations)

[Claim 42] Pretreatment liquid of the recorded material according to claim 26 characterized by being the compound in which a cationic high molecular compound is shown by the bottom formula.

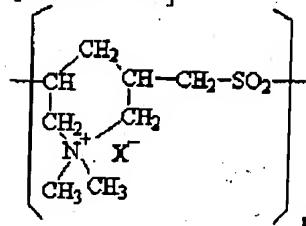
[Formula 16]



(For the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and Q, the monomer component of arbitration which can be copolymerized, and n and m are [X-] the independent number of polymerizations)

[Claim 43] Pretreatment liquid of the recorded material according to claim 26 characterized by being the polymer in which a cationic high molecular compound is shown by the bottom formula.

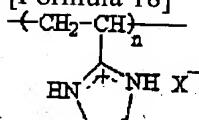
[Formula 17]



(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of polymerizations)

[Claim 44] Pretreatment liquid of the recorded material according to claim 26 characterized by being the polymer in which a cationic high molecular compound is shown by the bottom formula.

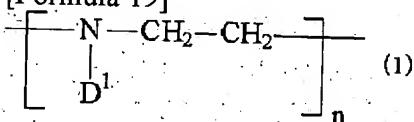
[Formula 18]



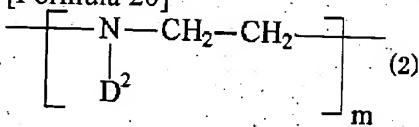
(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of polymerizations)

[Claim 45] Pretreatment liquid of the recorded material according to claim 26 characterized by being cationic resin with which a cationic high molecular compound contains the following general formula (1) and/or a formula (2) as a structural unit.

[Formula 19]

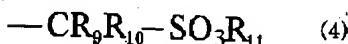
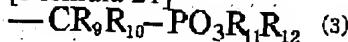


[Formula 20]



(D1 expresses the substituent shown in a bottom type (3) or a formula (4), and D2 is independent of D1, and expresses a hydrogen atom or a formula (3), and a formula (4).) n expresses the natural number and m expresses the integer of m>=0.

[Formula 21]



(Among a formula (3) and a formula (4), R9 and R10 are mutually-independent, the alkyl group or allyl group of a hydrogen atom or carbon numbers 1-12 is expressed, R11 and R12 are mutually-independent, and the substituent shown in a hydrogen atom or alkali metal, and a bottom type (5) is expressed)

[Formula 22]



(Among a formula (5), R13-R16 are independent respectively, and express a hydrogen atom or the alkyl group of arbitration, an allyl group, a hydroxyalkyl radical, and the substituent chosen from benzyl)

[Claim 46] Pretreatment liquid of the recorded material according to claim 25 to 45 characterized by the above-mentioned cationic compound being distributed by the solvent object as a particle.

[Claim 47] Pretreatment liquid of the recorded material according to claim 25 characterized by being the cationic silica

by which the above-mentioned cationic compound is distributed by the solvent object as a particle.

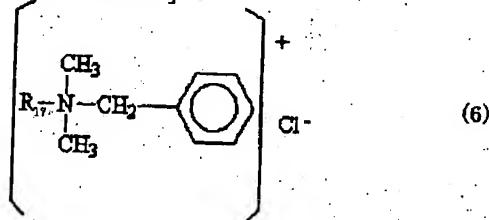
[Claim 48] Pretreatment liquid of the recorded material according to claim 46 characterized by the cationic compound currently distributed by the above-mentioned solvent object as a particle being a cationic emulsion.

[Claim 49] Pretreatment liquid of the recorded material according to claim 14 to 21 with which the compound to which the dispersibility of the above-mentioned recording ink or solubility is made to fall is characterized by being water-soluble polyvalent metallic salt.

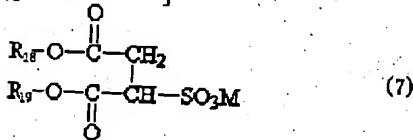
[Claim 50] Pretreatment liquid of the recorded material according to claim 14 to 49 characterized by the surfactant and/or getting wet and adjusting surface tension to 40 or less mN/m, including an accelerator.

[Claim 51] Pretreatment liquid of the recorded material according to claim 50 characterized by the above-mentioned surfactant being at least one sort expressed with following general formula (6) - (11).

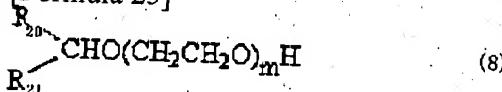
[Formula 23]



(R17 expresses either a lauryl radical, a stearyl radical and the Millis Chill radical among a formula (6))
[Formula 24]

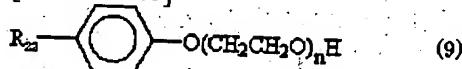


(R18 and R19 express a with a carbon numbers of three or more which may branch alkyl group among a formula (7), and M expresses alkali metal, ammonium, alkanolamine, the 4th class ammonium, or the 4th class phosphonium)
[Formula 25]



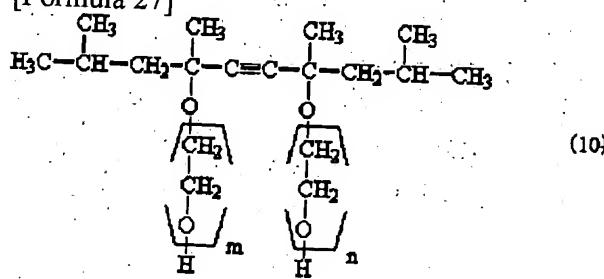
(R20 and R21 express the alkyl group of carbon numbers 5-7 among a formula (8), and m expresses the integer of 5-20)

[Formula 26]

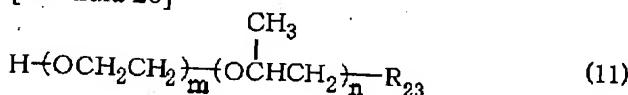


(R22 expresses the chain with which carbon numbers 6-14 may branch among a formula (9), and n expresses the integer of 5-20)

[Formula 27]



(m and n express the integer of 0-20 among a formula (10))
[Formula 28]



(R23 expresses the chain with which carbon numbers 6-14 may branch among a formula (11), and m and n express the integer of 0-20)

[Claim 52] Pretreatment liquid of the recorded material according to claim 50 or 51 characterized by the content of the above-mentioned surfactant being 0.1 - 10 % of the weight.

[Claim 53] Pretreatment liquid of the recorded material according to claim 14 to 52 characterized by containing preservation-from-decay material and/or an antifungal agent 0.1 to 5% of the weight.

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[Claim 2] The image recording approach according to claim 1 which the above-mentioned pretreatment liquid contains the compound to which the dispersibility of the color material in the above-mentioned recording ink or solubility is made to fall ten to 80% of the weight, and is characterized by the viscosity in 25 degrees C being 10 - 10000 mPa·s.

[Claim 3] The image recording approach according to claim 1 or 2 characterized by the viscosity in the above-mentioned 25 degrees C being 20 - 10000 mPa·s.

[Claim 4] The image recording approach according to claim 1 to 3 characterized by giving so that coating weight may serve as 0.5 g/m² - 10 g/m² in case the above-mentioned pretreatment liquid is given to the above-mentioned recorded material.

[Claim 5] The image recording approach according to claim 1 to 4 characterized by the contact angle of the above-mentioned recording ink to the recorded material after grant of the above-mentioned pretreatment liquid being 90 or less degrees.

[Claim 6] The image recording approach according to claim 1 to 5 that the above-mentioned aforementioned pretreatment liquid is surface tension 40 - 60 mN/m, and the above-mentioned recording ink is surface tension 20 - 40 mN/m.

[Claim 7] The image recording approach according to claim 1 to 6 characterized by giving pretreatment liquid besides the part in which the image of the above-mentioned recorded material is formed in case the above-mentioned pretreatment liquid is given to the above-mentioned recorded material.

[Claim 8] The image recording approach according to claim 1 to 7 characterized by giving pretreatment liquid to a recorded material front face with a grant means to contact a recorded material in case the above-mentioned pretreatment liquid is given to the above-mentioned recorded material.

[Claim 9] The image recording approach according to claim 8 characterized by a grant means to contact the above-mentioned recorded material being a roller.

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[Claim 11] The image recording approach according to claim 1 to 10 which the above-mentioned recorded material uses pulp fiber as a principal component, and is characterized by being more than 10S and air permeability 5-50S whenever [size].

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[Claim 13] The image recording approach according to claim 12 characterized by being at least one chosen from the group which a compound and/or an anionic color material anionic [above-mentioned] become from an anionic color, the pigment distributed with the anionic dispersant or a color, the pigment embellished with the anionic radical, and an anionic coloring particle.

[Claim 14] Pretreatment liquid of the recorded material of the colorlessness which is the pretreatment liquid used for the image recording approach according to claim 1 to 13, and contains the compound to which the solubility of

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[Claim 20] Pretreatment liquid of the **-ed material according to claim 18 or 19 characterized by making the content of water below into the amount of equilibrium moisture in 60%RH of the water-soluble liquefied compound to contain.

[Claim 21] Pretreatment liquid of the recorded material according to claim 14 to 17 characterized by containing a water-soluble organic solvent five to 70% of the weight.

[Claim 22] Pretreatment liquid of the recorded material according to claim 14 to 21 with which the compound to which the solubility of the above-mentioned recording ink or dispersibility is made to fall is characterized by being an ionicity compound.

[Claim 23] Pretreatment liquid of the recorded material according to claim 22 characterized by the above-mentioned ionicity compound being an ionicity compound which has a with a carbon numbers of six or more alkyl group.

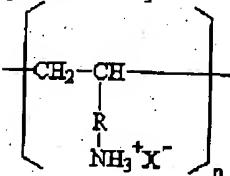
[Claim 24] Pretreatment liquid of the recorded material according to claim 23 with which the above-mentioned ionicity compound is characterized by being an ionicity high molecular compound.

[Claim 25] Pretreatment liquid of the recorded material according to claim 22 to 24 with which the above-mentioned ionicity compound is characterized by being a cationic compound.

[Claim 26] Pretreatment liquid of the recorded material according to claim 25 characterized by the above-mentioned cationic compound being a cationic high molecular compound.

[Claim 27] Pretreatment liquid of the recorded material according to claim 26 characterized by being the compound in which the above-mentioned cationic high molecular compound is shown by the bottom formula.

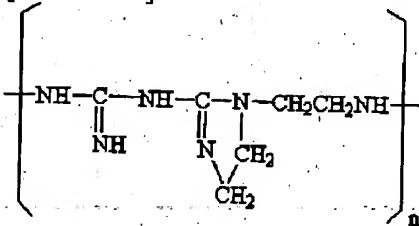
[Formula 1]



(For the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and R, the alkylene group of carbon numbers 1-3 and n are [X-] the number of polymerizations)

[Claim 28] Pretreatment liquid of the recorded material according to claim 26 characterized by being dicyandiamide resin in which a cationic high molecular compound is shown by the bottom formula.

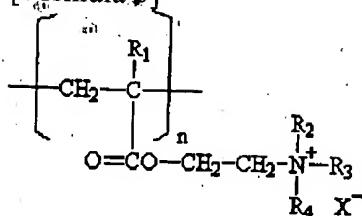
[Formula 2]



(n is the number of polymerizations)

[Claim 29] Pretreatment liquid of the recorded material according to claim 26 characterized by being the 4th class salt polymerization object of dialkyl aminoethyl (meta) acrylate in which a cationic high molecular compound is shown by the bottom formula.

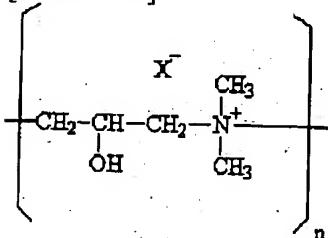
[Formula 3]



(For H, or CH₃, R₂, R₃ and R₄, H or an alkyl group, and n are [X- / the anion of either halogen ion, nitrate ion nitrite ion and acetic-acid ion, and R₁] the number of polymerizations)

[Claim 30] Pretreatment liquid of the recorded material according to claim 26 characterized by being the cationic high molecular compound in which a cationic high molecular compound is shown by the bottom formula.

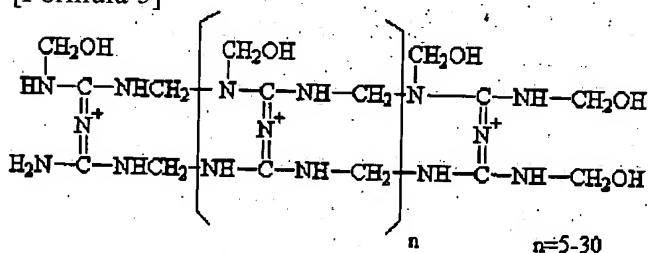
[Formula 4]



(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of polymerizations)

[Claim 31] Pretreatment liquid of the recorded material according to claim 26 characterized by being dicyandiamide resin in which a cationic high molecular compound is shown by the bottom formula.

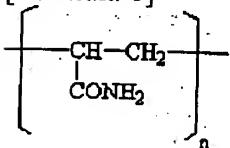
[Formula 5]



(n is the natural number of 5-30)

[Claim 32] Pretreatment liquid of the recorded material according to claim 26 characterized by being the polyacrylamide a cationic high molecular compound is indicated to be by the bottom formula.

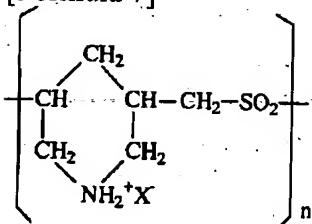
[Formula 6]



(n is the number of polymerizations)

[Claim 33] Pretreatment liquid of the recorded material according to claim 26 characterized by being the polymer in which a cationic high molecular compound is shown by the bottom formula.

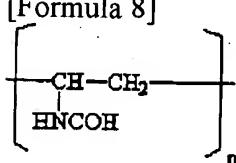
[Formula 7]



(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of

(polymerizations)

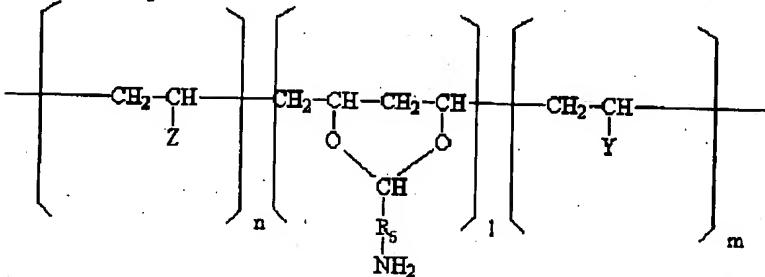
[Claim 34] Pretreatment liquid of the recorded material according to claim 26 characterized by being the polyvinyl formamide a cationic high molecular compound is indicated to be by the bottom formula.
 [Formula 8]



(n is the number of polymerizations)

[Claim 35] Pretreatment liquid of the recorded material according to claim 26 characterized by being the polymer in which a cationic high molecular compound is shown by the bottom formula.

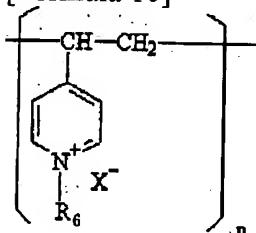
[Formula 9]



(For -OCOCH₃ or -OH, and R₅, the alkylene group of carbon numbers 1-4, and n, l and m are [Z and Y] the number of polymerizations, respectively)

[Claim 36] Pretreatment liquid of the recorded material according to claim 26 characterized by being the polyvinyl pyridine a cationic high molecular compound is indicated to be by the bottom formula.

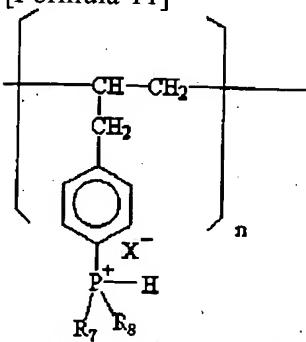
[Formula 10]



(For low-grade alkyl group and X-, the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion and n are [R₆] the number of polymerizations)

[Claim 37] Pretreatment liquid of the recorded material according to claim 26 characterized by being the polyvinylbenzyl phosphonium a cationic high molecular compound is indicated to be by the bottom formula.

[Formula 11]

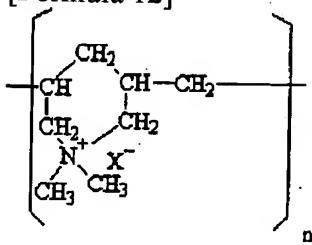


(For hydrogen or low-grade alkyl group, and X-, the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion and n are [R₇ and R₈] the number of polymerizations)

[Claim 38] Pretreatment liquid of the recorded material according to claim 26 characterized by being the dimethyl diaryl ammonium salt polymerization object in which a cationic high molecular compound is shown by the bottom

formula.

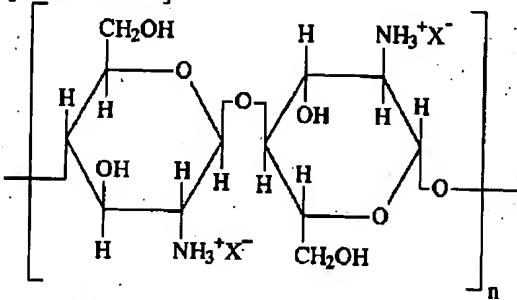
[Formula 12]



(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of polymerizations)

[Claim 39] Pretreatment liquid of the recorded material according to claim 26 characterized by being the chitosan salt a cationic high molecular compound is indicated to be by the bottom formula.

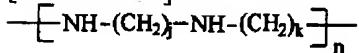
[Formula 13]



(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of polymerizations)

[Claim 40] Pretreatment liquid of the recorded material according to claim 26 characterized by being polyalkylene polyamine a cationic high molecular compound is indicated to be by the bottom formula.

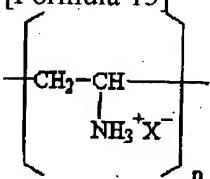
[Formula 14]



(j and k are independent respectively and the natural number of 2-6 and n are the number of polymerizations)

[Claim 41] Pretreatment liquid of the recorded material according to claim 26 characterized by being polyamine a cationic high molecular compound is indicated to be by the bottom formula.

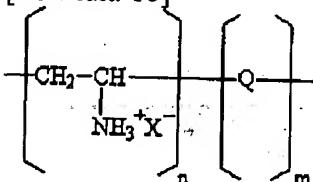
[Formula 15]



(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of polymerizations)

[Claim 42] Pretreatment liquid of the recorded material according to claim 26 characterized by being the compound in which a cationic high molecular compound is shown by the bottom formula.

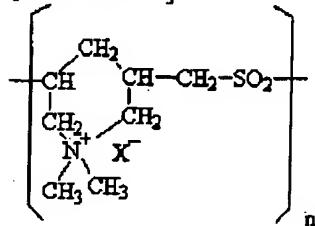
[Formula 16]



(For the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and Q, the monomer component of arbitration which can be copolymerized, and n and m are [X-] the independent number of polymerizations)

[Claim 43] Pretreatment liquid of the recorded material according to claim 26 characterized by being the polymer in which a cationic high molecular compound is shown by the bottom formula.

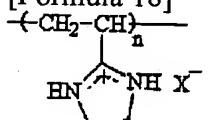
[Formula 17]



(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of polymerizations)

[Claim 44] Pretreatment liquid of the recorded material according to claim 26 characterized by being the polymer in which a cationic high molecular compound is shown by the bottom formula.

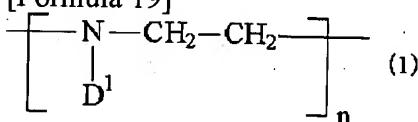
[Formula 18]



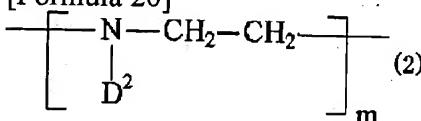
(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of polymerizations)

[Claim 45] Pretreatment liquid of the recorded material according to claim 26 characterized by being cationic resin with which a cationic high molecular compound contains the following general formula (1) and/or a formula (2) as a structural unit.

[Formula 19]

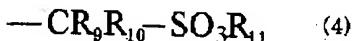
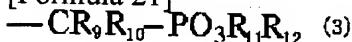


[Formula 20]



(D1 expresses the substituent shown in a bottom type (3) or a formula (4), and D2 is independent of D1, and expresses a hydrogen atom or a formula (3), and a formula (4).) n expresses the natural number and m expresses the integer of m>=0.

[Formula 21]



(Among a formula (3) and a formula (4), R9 and R10 are mutually-independent, the alkyl group or allyl group of a hydrogen atom or carbon numbers 1-12 is expressed, R11 and R12 are mutually-independent, and the substituent shown in a hydrogen atom or alkali metal, and a bottom type (5) is expressed)

[Formula 22]



(Among a formula (5), R13-R16 are independent respectively, and express a hydrogen atom or the alkyl group of arbitration, an allyl group, a hydroxyalkyl radical, and the substituent chosen from benzyl)

[Claim 46] Pretreatment liquid of the recorded material according to claim 25 to 45 characterized by the above-mentioned cationic compound being distributed by the solvent object as a particle.

[Claim 47] Pretreatment liquid of the recorded material according to claim 25 characterized by being the cationic silica

by which the above-mentioned cationic compound is distributed by the solvent object as a particle.

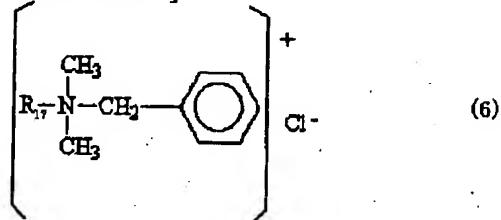
[Claim 48] Pretreatment liquid of the recorded material according to claim 46 characterized by the cationic compound currently distributed by the above-mentioned solvent object as a particle being a cationic emulsion.

[Claim 49] Pretreatment liquid of the recorded material according to claim 14 to 21 with which the compound to which the dispersibility of the above-mentioned recording ink or solubility is made to fall is characterized by being water-soluble polyvalent metallic salt.

[Claim 50] Pretreatment liquid of the recorded material according to claim 14 to 49 characterized by the surfactant and/or getting wet and adjusting surface tension to 40 or less mN/m, including an accelerator.

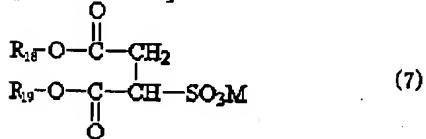
[Claim 51] Pretreatment liquid of the recorded material according to claim 50 characterized by the above-mentioned surfactant being at least one sort expressed with following general formula (6) - (11).

[Formula 23]



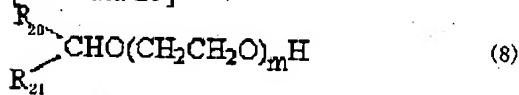
(R17 expresses either a lauryl radical, a stearyl radical and the Millis Chill radical among a formula (6))

[Formula 24]



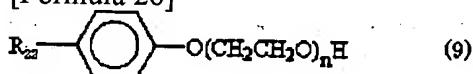
(R18 and R19 express a with a carbon numbers of three or more which may branch alkyl group among a formula (7), and M expresses alkali metal, ammonium, alkanolamine, the 4th class ammonium, or the 4th class phosphonium)

[Formula 25]



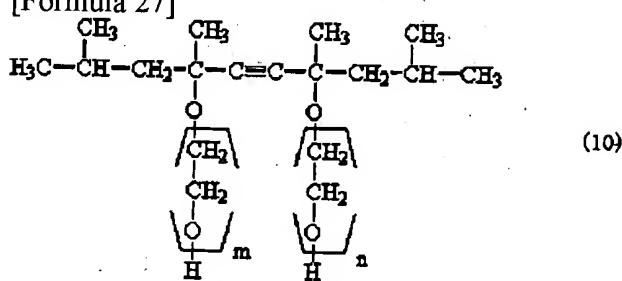
(R20 and R21 express the alkyl group of carbon numbers 5-7 among a formula (8), and m expresses the integer of 5-20)

[Formula 26]



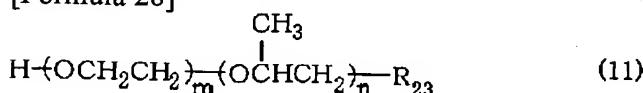
(R22 expresses the chain with which carbon numbers 6-14 may branch among a formula (9), and n expresses the integer of 5-20)

[Formula 27]



(m and n express the integer of 0-20 among a formula (10))

[Formula 28]



(R23 expresses the chain with which carbon numbers 6-14 may branch among a formula (11), and m and n express the integer of 0-20)

[Claim 52] Pretreatment liquid of the recorded material according to claim 50 or 51 characterized by the content of the above-mentioned surfactant being 0.1 - 10 % of the weight.

[Claim 53] Pretreatment liquid of the recorded material according to claim 14 to 52 characterized by containing preservation-from-decay material and/or an antifungal agent 0.1 to 5% of the weight.

[Translation done.]

* NOTICES *

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the pretreatment liquid to the recorded material in an image recording method, and the image recording method using it.

[0002]

[Description of the Prior Art] In recent years, an ink jet printer spreads from advantages, such as low noise and a low running cost, and the color printer printable in a regular paper is also supplied to the commercial scene. Although the soluble high color has mainly been conventionally used for the ink of the ink jet printer for office as a coloring agent from problems, such as blinding of ink, in order to produce the poster with which a water resisting property and lightfastness are demanded, use of the ink which contains a pigment as a coloring agent has also been increasing. moreover, in case a color picture is printed with an ink jet printer in a regular paper in order to press down the blot by color boundaries, such as 2 color pile parts, raising the permeability of ink is performed by adding a surfactant etc. in ink -- **** (JP,55-65269,A etc.) -- In that case, although the device of using the low ink of permeability is made only in case a black alphabetic character is printed since a feather ring is generated with an alphabetic character or a thin line, all of prevention of feather ring generating with the control and alphabetic character, and thin line of a blot in a color boundary are still insufficient.

[0003] Then, in order to solve such a problem, when the image in ink is formed in recorded material front faces, such as a regular paper, using the recorded material which carried out coating of the ingredient for the color in ink being established beforehand, and the recorded material which carried out coating of white pigments or the water soluble polymer to the front face is indicated by JP,56-86789,A, JP,55-144172,A, JP,55-81992,A, JP,52-53012,A; or JP,56-89594,A. These are the recorded materials which performed special processing, since it corresponds to common recorded materials, such as a regular paper, polymer solutions, such as a carboxymethyl cellulose, polyvinyl alcohol, and polyvinyl acetate, are beforehand injected on a recorded material, and the ink jet record approach of injecting and printing ink into the part to which the polymer solution subsequently adhered is proposed by JP,56-89595,A. However, with these polymer solutions, the feather ring was not pressed down and a water resisting property has not been improved at all, either.

[0004] Moreover, after adhering the pretreatment liquid of the recorded material containing the compound which insolubilizes the color in ink by the ink jet approach on a recorded material, the ink jet record approach of injecting and printing ink into the part to which the pretreatment liquid of the recorded material adhered is indicated by JP,64-63185,A, JP,8-20159,A, or JP,8-20161,A. However, in order to be stabilized and to make pretreatment liquid inject also by these approaches, viscosity of pretreatment liquid needed to be made low and a low concentration fake colande was not obtained for the compound which therefore insolubilizes a color. In order to acquire image quality improvement effect sufficient with such pretreatment liquid, pretreatment liquid must be given comparatively so much, therefore it was easy to generate curl and cock ring of a recorded material. Especially, the moisture coating weight in 2 color pile sections was large, and there was not only a cock ring but a problem that the strike-through of ink was large.

[0005] Moreover, after applying to a record medium the colorless liquid constituent which contained a silicone compound and cationic compounds, such as silicone oil, at least, the image formation approach characterized by making the record ink containing an anionic component adhere by the ink jet recording method is proposed by JP,8-142500,A. However, since the permeability of ink was remarkable and low, when desiccation of the image section was slow and performed high-speed printing by this image formation approach, in addition to low osmosis, since the part to which the silicone compound adhered had the bad wettability to a record medium, it produced coalescence of a contiguity dot, and had produced the problem that image quality deteriorated remarkably -- a white muscle occurs

along a head main scanning direction in the poor image section etc.. Moreover, if the mothball of this colorless liquid constituent is carried out, silicone oil will decompose, or phase separation is produced, and the stable recording characteristic is not acquired.

[0006] Moreover, after giving the image-recording promotion liquid of the colorlessness containing the compound which insolubilizes the coloring agent in the recording ink which consists of a coloring agent and a solvent which distributes or dissolves this in JP,10-250216,A by these people, or light color to a recorded material, the image-recording approach characterized by for image-recording promotion liquid to contain a predetermined surfactant has proposed in the approach of forming an image by breathing out recording ink as a drop and making it adhere to a recorded material. Although according to this approach drying [of an image] improved and correspondence became possible at high-speed record in order that the surfactant in image recording promotion liquid might improve permeability and wettability, osmosis in the interior of paper of color material may be promoted with a surfactant, and the further improvement was called for from fear, such as increase of a strike-through, a fall of image concentration, and generating of a feather ring.

[0007] the polyvalent metallic salt of water solubility [JP,2000-37942,A] -- or after pressurizing or heating the recorded material with which the pretreatment liquid which contains the poly allylamine by 20 - 25% of the weight of concentration was given to the recorded material by the ink jet method, and liquid was given, the approach of recording with the recording ink which contains a pigment as a color material is indicated. By this approach, pretreatment liquid is supposed that 1 / equivalent image is obtained about by ten to 1/2 as compared with the approach of not performing the conventional pressurization process. Moreover, it is supposed by pressurizing that the wrinkle generated in a recorded material can be prevented. However, by this approach, the equipment for forming an image becomes the process which pressurizes or heats a recorded material is required, and complicated. Incidentally, since pretreatment liquid is given to the recorded material by the on-demand ink jet method, pretreatment liquid is presumed to be that for which the thing of hypoviscosity is used here:

[0008] The pretreatment liquid formula which made JP,11-10856,A, JP,2000-44855,A, JP,2000-63719,A, etc. contain water-soluble polyvalent metallic salt to 35% of the weight of concentration is indicated. However, as for the pretreatment liquid indicated by these official reports, like the above-mentioned official report, since pretreatment liquid is given to the recorded material by the on-demand ink jet method, the viscosity of pretreatment liquid is presumed to be that for which the thing of hypoviscosity is used by each. Thus, when the pretreatment liquid of hypoviscosity was used, the effectiveness which raises image quality was weak and special recording ink, such as using the recording ink containing a polymer particle, needed to be used.

[0009] Although various proposals were made in order to record at high definition and a high speed to a regular paper as mentioned above, the sufficient solution approach was not yet proposed.

[0010]

[Problem(s) to be Solved by the Invention] Then, it is in offering the image recording method the image which was excellent in the water resisting property with the good high definition of the color tone which the technical problem of this invention solves such a trouble, is excellent in the repeatability of a thin line etc. to a variety of recorded materials, and does not have a color boundary blot is obtained. Moreover, the technical problem of this invention is to offer the image recording method which the strike-through of recording ink does not generate and in which regular paper double-sided printing is possible while being further hard to generate curl, a cock ring, etc. and obtaining an image with high image concentration. Furthermore, the technical problem of this invention is by using for an image recording method to offer the pretreatment liquid of the recorded material with which the above images are obtained.

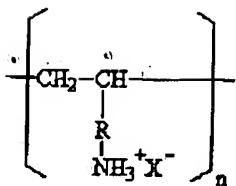
[0011]

[Means for Solving the Problem] this invention person etc. found out wholeheartedly that the above-mentioned problem was solvable by preceding forming an image by the ink jet method, and including the compound which insolubilizes the component in recording ink which is not in a recorded material front face until now in high concentration, and giving the pretreatment liquid which is hyperviscosity as a result of research.

[0012] (1) Before it gives pretreatment liquid to the recorded material front face which forms an image and this pretreatment liquid carries out desiccation solidification In the image recording approach which discharge and this recording ink are made for the recording ink containing color material to adhere to a recorded material as a drop according to a picture signal, and forms an image The image recording approach, [0013] which the above-mentioned pretreatment liquid contains the compound to which the dispersibility of the above-mentioned recording ink or

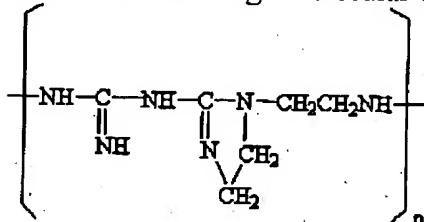
solubility is made to fall ten to 80% of the weight, and are characterized by the viscosity in 25 degrees C being 10 - 10000 mPa·s (2) The image recording approach given in (1) which the above-mentioned pretreatment liquid contains the compound to which the dispersibility of the color material in the above-mentioned recording ink or solubility is

made to fall ten to 80% of the weight, and is characterized by the viscosity in 25 degrees C being 10 - 10000 mPa-s, [0014] (3) (1) characterized by the viscosity in the above-mentioned 25 degrees C being 20 - 10000 mPa-s or the image recording approach given in (2), [0015] (4) The image recording approach given in either of (1) - (3) characterized by giving so that coating weight may serve as 0.5 g/m² - 10 g/m² in case the above-mentioned pretreatment liquid is given to the above-mentioned recorded material, [0016] (5) the above -- pretreatment -- liquid -- grant -- the back -- a recorded material -- receiving -- the above -- recording ink -- a contact angle -- 90 -- a degree -- less than -- it is -- things -- the description -- ** -- carrying out -- (-- one --) - (-- four --) -- either -- a publication -- image recording -- an approach -- [-- 0017 --] (6) The image recording approach given in either of (1) - (5) whose above-mentioned aforementioned pretreatment liquid is surface tension 40 - 60 mN/m and whose above-mentioned recording ink is surface tension 20 - 40 mN/m, [0018] (7) The image recording approach given in either of (1) - (6) characterized by giving pretreatment liquid besides the part in which the image of the above-mentioned recorded material is formed in case the above-mentioned pretreatment liquid is given to the above-mentioned recorded material, [0019] (8) The image recording approach given in either of (1) - (7) characterized by giving pretreatment liquid to a recorded material front face with a grant means to contact a recorded material in case the above-mentioned pretreatment liquid is given to the above-mentioned recorded material, [0020] (9) The image recording approach given in (8) characterized by a grant means to contact the above-mentioned recorded material being a roller, [0021] (10) (8) characterized by making heat energy act on recording ink after giving pretreatment liquid to a recorded material using a grant means to contact the above-mentioned recorded material before a pretreatment station dries or the image recording approach given in (9), [0022] (11) The image recording approach given in either of (1) - (10) which the above-mentioned recorded material uses pulp fiber as a principal component, and is characterized by being more than 10S and air permeability 5-50S whenever [size], [0023] (12) the above -- recording ink -- anionic -- a compound -- and/or -- anionic -- color material - containing -- things -- the description -- ** -- carrying out -- (-- one --) - (-- 11 --) -- either -- a publication -- image recording -- an approach -- [-- 0024 --] (13) The image recording approach given in (12) characterized by being at least one chosen from the group which a compound and/or an anionic color material anionic [above-mentioned] become from an anionic color, the pigment distributed with the anionic dispersant or a color, the pigment embellished with the anionic radical, and an anionic coloring particle, [0025] (14) (1) The pretreatment liquid of the recorded material of the colorlessness which is the pretreatment liquid used for the image recording approach given in either of (13), and contains the compound to which the solubility of recording ink or dispersibility is made to fall ten to 80% of the weight, and is characterized by the viscosity in 25 degrees C being 10 - 10000 mPa-s, or a thin color, [0026] (15). The pretreatment liquid of a recorded material given in (14) which contains the compound to which the solubility of the color material in recording ink or dispersibility is made to fall ten to 80% of the weight, and is characterized by the viscosity in 25 degrees C being 10 - 10000 mPa-s, [0027] (16) (14) characterized by the viscosity in the above-mentioned 25 degrees C being 20 - 10000 mPa-s or the pretreatment liquid of a recorded material given in (15), [0028] (17) The pretreatment liquid of a recorded material given in either of (14) - (16) characterized by containing a water-soluble organic solvent five to 70% of the weight, [0029] (18) The pretreatment liquid of a recorded material given in either of (14) - (17) characterized by containing water five to 80% of the weight, [0030] (19) The pretreatment liquid of a recorded material given in (14) - (17) characterized by containing water and a water-soluble liquefied compound 20- to 80% of the weight, [0031] (20) The pretreatment liquid of a recorded material given in (19) characterized by for the content of water being 40 or less % of the weight, and the content of a water-soluble liquefied compound being 20 - 80 % of the weight, [0032] (21) (19) characterized by making the content of water below into the amount of equilibrium moisture in 60%RH of the water-soluble liquefied compound to contain or the pretreatment liquid of a recorded material given in (20), [0033] (22) The pretreatment liquid of a recorded material given in either of (14) - (21) to which the compound to which the solubility of the above-mentioned recording ink or dispersibility is made to fall is characterized by being an ionicity compound, [0034] (23) The pretreatment liquid of a recorded material given in (22) characterized by the above-mentioned ionicity compound being an ionicity compound which has a with a carbon numbers of six or more alkyl group, [0035] (24) The pretreatment liquid of a recorded material given in (23) to which the above-mentioned ionicity compound is characterized by being an ionicity high molecular compound, [0036] (25) The pretreatment liquid of a recorded material given in either of (22) - (24) to which the above-mentioned ionicity compound is characterized by being a cationic compound, [0037] (26) The pretreatment liquid of a recorded material given in (25) characterized by the above-mentioned cationic compound being a cationic high molecular compound, [0038] (27) Pretreatment liquid of a recorded material given in (26) characterized by being the compound in which the above-mentioned cationic high molecular compound is shown by the bottom formula, [Formula 29]



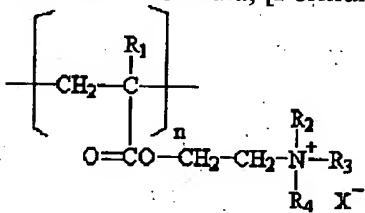
(For the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and R, the alkylene group of carbon numbers 1-3 and n are [X-] the number of polymerizations)

[0039] (28) Pretreatment liquid of a recorded material given in (26) characterized by being dicyandiamide resin in which a cationic high molecular compound is shown by the bottom formula, [Formula 30]



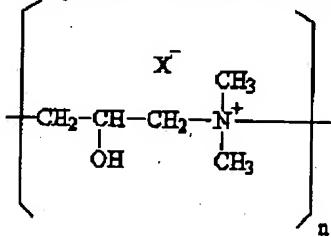
(n is the number of polymerizations)

[0040] (29) Pretreatment liquid of a recorded material given in (26) characterized by being the 4th class salt polymerization object of dialkyl aminoethyl (meta) acrylate in which a cationic high molecular compound is shown by the bottom formula, [Formula 31]



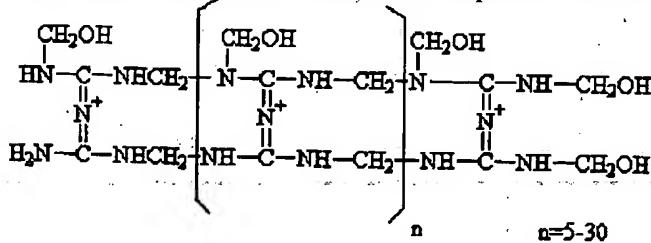
(For H, or CH₃, R₂, R₃ and R₄, H or an alkyl group, and n are [X- / the anion of either halogen ion, nitrate ion nitrite ion and acetic-acid ion, and R₁] the number of polymerizations)

[0041] (30) Pretreatment liquid of a recorded material given in (26) characterized by being the cationic high molecular compound in which a cationic high molecular compound is shown by the bottom formula, [Formula 32]



(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of polymerizations)

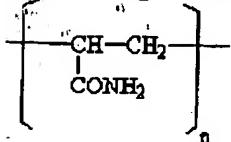
[0042] (31) Pretreatment liquid of a recorded material given in (26) characterized by being dicyandiamide resin in which a cationic high molecular compound is shown by the bottom formula, [Formula 33]



(n is the natural number of 5-30)

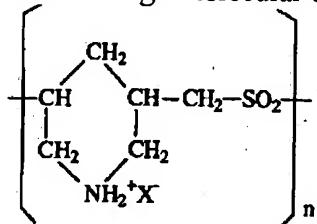
[0043] (32) Pretreatment liquid of a recorded material given in (26) characterized by being the polyacrylamide a

cationic high molecular compound is indicated to be by the bottom formula, [Formula 34]



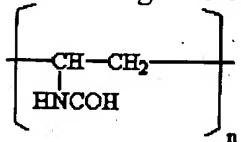
(n is the number of polymerizations)

[0044] (33) Pretreatment liquid of a recorded material given in (26) characterized by being the polymer in which a cationic high molecular compound is shown by the bottom formula, [Formula 35]



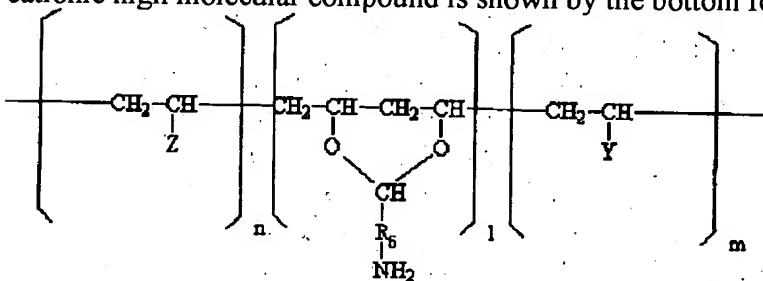
(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of polymerizations)

[0045] (34) Pretreatment liquid of a recorded material given in (26) characterized by being the polyvinyl formamide a cationic high molecular compound is indicated to be by the bottom formula, [Formula 36]



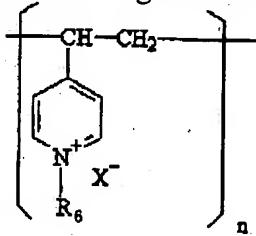
(n is the number of polymerizations)

[0046] (35) Pretreatment liquid of a recorded material given in (26) characterized by being the polymer in which a cationic high molecular compound is shown by the bottom formula, [Formula 37]



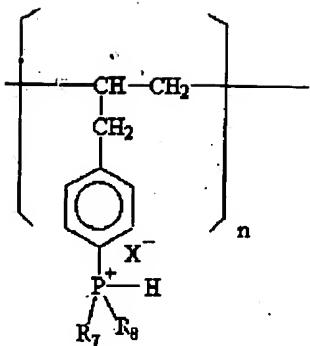
(For -OCOCH3 or -OH, and R5, the alkylene group of carbon numbers 1-4, and n, l and m are [Z and Y] the number of polymerizations, respectively)

[0047] (36) Pretreatment liquid of a recorded material given in (26) characterized by being the polyvinyl pyridine a cationic high molecular compound is indicated to be by the bottom formula, [Formula 38]



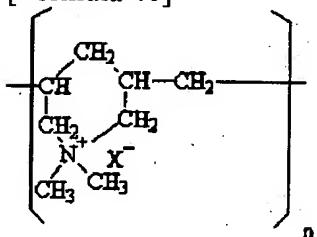
(For low-grade alkyl group and X-, the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion and n are [R6] the number of polymerizations)

[0048] (37) Pretreatment liquid of a recorded material given in (26) characterized by being the polyvinylbenzyl phosphonium a cationic high molecular compound is indicated to be by the bottom formula, [Formula 39]



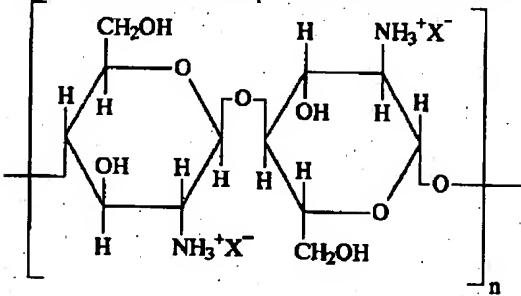
(For hydrogen or low-grade alkyl group, and X-, the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion and n are [R7 and R8] the number of polymerizations)

[0049] (38) Pretreatment liquid of a recorded material given in (26) characterized by being the dimethyl diaryl ammonium salt polymerization object in which a cationic high molecular compound is shown by the bottom formula, [Formula 40]



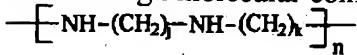
(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of polymerizations)

[0050] (39) Pretreatment liquid of a recorded material given in (26) characterized by being the chitosan salt a cationic high molecular compound is indicated to be by the bottom formula, [Formula 41]



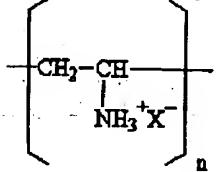
(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of polymerizations)

[0051] (40) Pretreatment liquid of a recorded material given in (26) characterized by being polyalkylene polyamine a cationic high molecular compound is indicated to be by the bottom formula, [Formula 42]



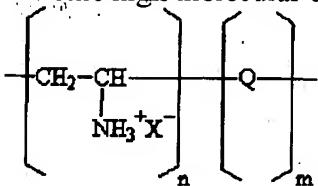
(j and k are independent respectively and the natural number of 2-6 and n are the number of polymerizations)

[0052] (41) Pretreatment liquid of a recorded material given in (26) characterized by being polyamine a cationic high molecular compound is indicated to be by the bottom formula, [Formula 43]



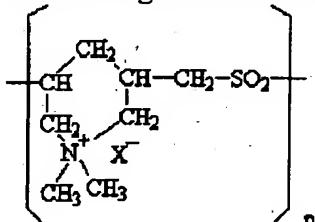
(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of polymerizations)

[0053] (42) Pretreatment liquid of a recorded material given in (26) characterized by being the compound in which a cationic high molecular compound is shown by the bottom formula, [Formula 44]



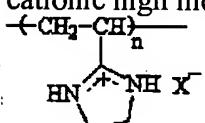
(For the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and Q, the monomer component of arbitration which can be copolymerized, and n and m are [X-] the independent number of polymerizations)

[0054] (43) Pretreatment liquid of a recorded material given in (26) characterized by being the polymer in which a cationic high molecular compound is shown by the bottom formula, [Formula 45]



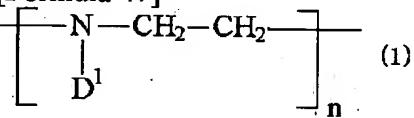
(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of polymerizations)

[0055] (44) Pretreatment liquid of a recorded material given in (26) characterized by being the polymer in which a cationic high molecular compound is shown by the bottom formula, [Formula 46]

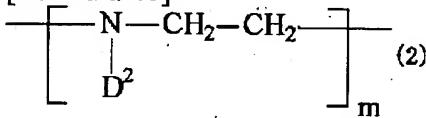


(X- is the anion of either halogen ion, nitrate ion, nitrite ion and acetic-acid ion, and n is the number of polymerizations)

[0056] (45) Pretreatment liquid of a recorded material given in (26) characterized by being cationic resin with which a cationic high molecular compound contains the following general formula (1) and/or a formula (2) as a structural unit, [Formula 47]



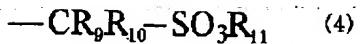
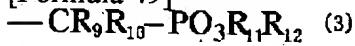
[Formula 48]



(D1 expresses the substituent shown in a bottom type (3) or a formula (4), and D2 is independent of D1, and expresses a hydrogen atom or a formula (3), and a formula (4).) n expresses the natural number and m expresses the integer of m>=0.

[0057]

[Formula 49]



(Among a formula (3) and a formula (4), R9 and R10 are mutually-independent, the alkyl group or allyl group of a hydrogen atom or carbon numbers 1-12 is expressed, R11 and R12 are mutually-independent, and the substituent

shown in a hydrogen atom or alkali metal, and a bottom type (5) is expressed)

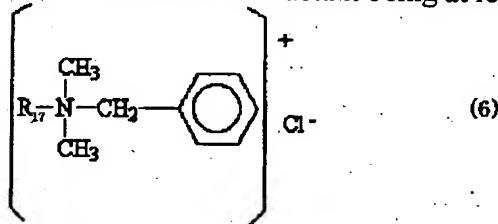
[0058]

[Formula 50]



(Among a formula (5), R13-R16 are independent respectively, and express a hydrogen atom or the alkyl group of arbitration, an allyl group, a hydroxyalkyl radical, and the substituent chosen from benzyl.)

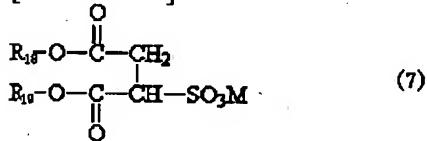
[0059] (46) The pretreatment liquid of a recorded material given in either of (25) - (45) characterized by the above-mentioned cationic compound being distributed by the solvent object as a particle, [0060] (47) The pretreatment liquid of a recorded material given in (25) characterized by being the cationic silica by which the above-mentioned cationic compound is distributed by the solvent object as a particle, [0061] (48) The pretreatment liquid of a recorded material given in (46) characterized by the cationic compound currently distributed by the above-mentioned solvent object as a particle being a cationic emulsion, [0062] (49) The pretreatment liquid of a recorded material given in either of (14) - (21) to which the compound made to insolubilize at least one component which is among recording ink is characterized by being water-soluble polyvalent metallic salt, [0063] (50) The pretreatment liquid of a recorded material given in either of (14) - (49) characterized by the surfactant and/or getting wet and adjusting surface tension to 40 or less mN/m including an accelerator, [0064] (51) Pretreatment liquid of a recorded material given in (50) characterized by the above-mentioned surfactant being at least one sort expressed with following general formula (6) - (11), [Formula 51]



(R17 expresses either a lauryl radical, a stearyl radical and the Millis Chill radical among a formula (6))

[0065]

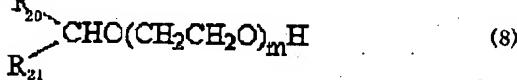
[Formula 52]



(R18 and R19 express a with a carbon numbers of three or more which may branch alkyl group among a formula (7), and M expresses alkali metal, ammonium, alkanolamine, the 4th class ammonium, or the 4th class phosphonium)

[0066]

[Formula 53]



(R20 and R21 express the alkyl group of carbon numbers 5-7 among a formula (8), and m expresses the integer of 5-20)

[0067]

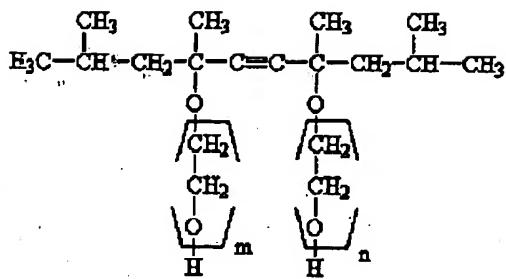
[Formula 54]



(R22 expresses the chain with which carbon numbers 6-14 may branch among a formula (9), and n expresses the integer of 5-20)

[0068]

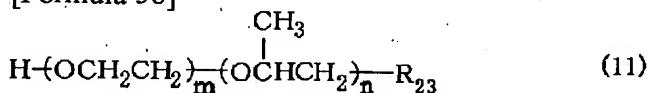
[Formula 55]



(m and n express the integer of 0-20 among a formula (10))

[0069]

[Formula 56]



(R23 expresses the chain with which carbon numbers 6-14 may branch among a formula (11), and m and n express the integer of 0-20)

[0070] (52) (50) characterized by the content of the above-mentioned surfactant being 0.1 - 10 % of the weight or the pretreatment liquid of a recorded material given in (51), [0071] (53) the pretreatment liquid of a recorded material given in either of (14) - (52) characterized by containing preservation from decay and an antifungal agent 0.1 to 5% of the weight -- come out.

[0072] As the term of the conventional technique described, after having injected the pretreatment liquid of the colorlessness containing the compound made to insolubilize the color material in recording ink, or a thin color to the recorded material by the ink jet method, and giving it or applying it with a roller, the approach of forming an image by the ink jet record approach was learned. However, in the approach learned conventionally, the pretreatment liquid of the hypoviscosity of less than 10 mPa·s was used. The liquid of the viscosity beyond this is because injecting becomes difficult with the usual on-demand mold ink JIETO head. Moreover, also when a roller gave, being high concentration and using conventionally, the compound to which the dispersibility of recording ink or solubility is made to fall by hyperviscosity was not considered. Therefore, if comparatively a lot of liquid was not adhered to a recorded material in order to acquire the effectiveness of image upgrading, also when applying the pretreatment liquid of a recorded material with a roller, for the **** reason in ****, the approach of giving pretreatment liquid with a roller was what does not have a merit only in an image part as compared with the approach of giving pretreatment liquid by the ink jet method.

[0073] In this invention, the above-mentioned problem was solvable by making pretreatment liquid contain the compound to which the dispersibility of recording ink of the high concentration of 10 - 80 % of the weight or solubility is made to fall, and the compound to which the dispersibility of the color material in recording ink or solubility is made to fall especially, and making viscosity of pretreatment liquid into 10 - 10000 mPa·s. That is, also in the condition with very few amounts of grants to the recorded material of pretreatment liquid, the color boundary blot, the feather ring, and the good image without a strike-through were obtained by making the configuration of the pretreatment liquid of a recorded material into an above-mentioned thing. That is, a good image is obtained also in a small amount of grants called [liquid / of the recorded material concerning this invention / pretreatment] 0.5 g/m² - 10 g/m² in the amount of grants.

[0074] Although the content of the compound to which the dispersibility of the recording ink in pretreatment liquid or the solubility in this invention is made to fall was 10 - 80 % of the weight, in order to improve an image, since the moisture content in liquid was high, by less than 10 % of the weight, pretreatment liquid had the problem that a cock ring was generated in the given recorded material with conventional pretreatment liquid required [the amount of grants of about 10 g/m² - 30 g/m²]. Moreover, even if it gave a lot of pretreatment liquid in this way, the improvement effect of a color boundary blot and a feather ring was not enough. In the liquid component in liquid evaporating, or being easy to produce precipitate in liquid under the effect of the heat histories, such as cooling of liquid, and giving pretreatment liquid, it becomes difficult to maintain dependability, when it considers as the content to which the compound to which the dispersibility of recording ink or solubility is made to fall exceeds 80 % of the weight. Moreover, when it considers as the content exceeding 80 % of the weight, it also becomes difficult to give liquid at homogeneity to a recorded material. Although the optimal content in the inside of the pretreatment liquid of the compound to which the dispersibility of recording ink or solubility is made to fall changes with elements, such as a formula of the compound to

be used and recording ink, and an amount of the recording ink printed by per unit area, it is range where 20 - 60 % of the weight is especially desirable.

[0075] Still more preferably, it is 100 - 3000 mPa-s, and the viscosity of pretreatment liquid is 10 - 10000 mPa-s (25 degrees C, rotor NO.4, rotational frequency 30rpm) in a Brookfield viscometer, and it is [it is the range of 20 - 10000 mPa-s, and / the balance of the improvement effectiveness of image quality and pretreatment liquid drying in 300 - 2000 mPa-s of especially the desirable range is good and] especially desirable [the range].

[0076] The thing with the large improvement effect of an image is explained as follows by using the pretreatment liquid of the hyperviscosity which is not in the former. that is, with the pretreatment liquid of the conventional hypoviscosity, if pretreatment liquid is used as the liquid of permeability, since a recorded material, especially a regular paper will be deep, it will enter until and a reaction with recording ink will not arise on the surface of a recorded material, prevention of a strike-through, prevention of a feather ring, and the prevention effectiveness of a color boundary blot will become small. On the contrary, in the color boundary blot prevention effectiveness's becoming weak or performing high-speed printing in order that recording ink may carry out a long duration residual on the surface of a recorded material although the reaction with recording ink is produced on the surface of a recorded material if liquid is the formula which fell the permeability to a recorded material in the pretreatment liquid of hypoviscosity, poor permeability, i.e., the problem said that drying [of an image] worsens, arises. In this case, if a lot of pretreatment liquid is given in order to acquire sufficient image quality improvement effect, since pretreatment liquid permeates the interior of a recorded material and a coloring agent also permeates the interior of a recorded material, the fall of image concentration will be brought about. Moreover, the solvent component contained in pretreatment liquid is easy to cause curl of a recorded material, and a cock ring. If the viscosity of pretreatment liquid exceeds 10000 mPa-s, since it not only becomes difficult to give liquid at homogeneity to a recorded material, but pretreatment liquid will not permeate a recorded material at all, admiration remains in the recorded material after printing all over, and it is not desirable.

[0077] In this invention, after giving pretreatment liquid to a recorded material, before pretreatment liquid dries, an image is formed with recording ink. If a recorded material is heated, or it is left at a room temperature for a long time and pretreatment liquid dries, the result which is not desirable -- a color boundary blot and a feather ring will be generated -- will be produced. After making it dryness, in order to print an image and to improve image quality, the amount of grants exceeding 30 g/m² is required, and is not economically desirable.

[0078] In this invention, it is desirable to give pretreatment liquid to a recorded material front face with a grant means by which pretreatment liquid contacts a recorded material rather than means by which it does not contact, such as the ink jet method.

[0079] The means of contacting the foam into which a roller-coating machine, a wire bar, and a coating blade and pretreatment liquid were made to sink as a means to give the pretreatment liquid of this invention in contact with a recorded material can be illustrated. Furthermore, in the pretreatment liquid of the recorded material given by this contact grant means, by the above-mentioned conventional approach, many additives which were not able to be blended can also be blended and the degree of freedom which constructs the formula of the pretreatment liquid of a recorded material can be extended greatly. Since it becomes possible it to be possible to give hyperviscous pretreatment liquid to homogeneity so that it may become the amount of grants from which the improvement effectiveness of sufficient image quality is acquired, and to be low cost about a grant means, and to produce in a compact by the simple equipment configuration by using a roller also in the grant means of contact, it is desirable. Thus, a high-concentration fixing agent is contained, and while being able to prevent generating of the cock ring of the recorded material which had produced hyperviscous pretreatment liquid in the conventional method by [little / far] carrying out amount grant rather than the amount of grants of conventional pretreatment liquid in the recorded material with the grant means of contact, the improvement effectiveness of the image quality beyond a conventional method is acquired.

[0080] Moreover, when [which are more than 10S and air permeability 5-50S whenever / size / general] an image is recorded, it is usually easy to use pulp fiber as a principal component as a recorded material, and to produce the fall of a feather ring, a color boundary blot, a strike-through, and image concentration in paper, without giving pretreatment liquid. Therefore, this invention uses pulp fiber as a principal component, and effectiveness is the largest [this invention] when [which are more than 10S and air permeability 5-50S whenever / size / general] it usually applies to paper.

[0081] The presentation of the pretreatment liquid of this invention is explained. The case where the anionic compound or the particle charged in negative is contained in current and the water recording ink generally used is a large majority. Therefore, it is desirable to react with anionic compounds, such as an anionic color contained in recording ink, an anionic pigment, an anionic high molecular compound, and anionic mama RUJON, or the particle charged in negative, and to contain a cationic compound in pretreatment liquid as a compound to which dispersibility or solubility is made

to fall. Also in a cationic compound, the particle to which the cationic high molecular compound was charged in the anionic compound especially in recording ink or negative, and the capacity to react are high, and desirable.

[0082] When pretreatment liquid is cationicity, it is shown in a recorded material front face, and image quality improvement effects, such as the repeatability of a thin line, waterproof improvement, and blot prevention, are acquired by the interaction like ion with the anionic component in recording ink. As mentioned above, the pretreatment liquid of the hyperviscosity which was not able to be used by the pretreatment approach made to breathe out as a drop with an ink jet method is usable. That is, pretreatment liquid can be made to contain a cationic high molecular compound by high concentration. Since there is little coating weight, it ends and a cationic high molecular compound remains near the front face by making it adhere by the film in high concentration, image quality becomes remarkably good and curl of a recorded material, a cock ring, etc. can be pressed down.

[0083] In this invention, since the viscosity of pretreatment liquid is high, as compared with conventional pretreatment liquid, the range of ingredient selection becomes remarkably large. In order that the ingredient used for conventional pretreatment liquid may maintain hypoviscosity, for example, when it was a high molecular compound, the polymerization degree, molecular weight, -dimensional [2], and the three-dimensional structure had remarkable constraint. In this invention, it turned out that each cationic high molecular compound given in the above-mentioned (27) - (45) term is preferably used for the pretreatment liquid of this invention as a compound to which the solubility of recording ink or dispersibility is reduced.

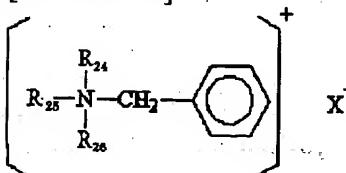
[0084] The cationic high molecular compound which contains the formula (1) of a publication and (2) in the above-mentioned (45) term as a structural unit has the preferably [the thing of the range of 100,000 is / weight average molecular weight / desirable still more desirable from 1000, and / from 2000 / 50,000 and one layer of twists] desirable thing of 30,000 from 2000. If weight average molecular weight is larger than 100,000, since it will be hard to melt into a solvent, pretreatment liquid becomes an ununiformity and it becomes easy to produce the unevenness of image quality. On the contrary, when weight average molecular weight is smaller than 1000, the effectiveness of blot prevention or waterproof improvement is small, and is not desirable.

[0085] Moreover, in order to acquire an anionic component and high reactivity, as for whenever [in pH4 of cationic resin / cation], it is still more preferably desirable that they are 3.5 or more meq/g 3 or more meq/g. With whenever [cation], it asks by the colloidal titration using a polyvinyl potassium sulfate reagent. In detail, it can ask in the following procedures. That is, 90ml of deionized water is taken to a conical beaker, and 10ml of 500 ppm water solutions of a sample (**** conversion) is added, and in a hydrochloric-acid water solution, it is referred to as pH4.0 and stirs for about 1 minute. Next, 2-3 drops of toluidine-blue indicators are added, and are titrated with N / 400 polyvinyl potassium sulfate reagent (N/400PVSK). A titration rate is considered as a part for 2ml/, and makes a terminal point the time of test water becoming a purplish red color and holding more than for 10 seconds from blue. It can ask whenever [cation] by (meq/g)=(N / 400PVSK titration value) x (potency of N/400PVSK) / 2. It becomes possible to obtain a high-definition image, without what has whenever [cation / higher] being able to have stronger cationicity, being able to react efficiently with the anionic component in recording ink; being able to reduce the initial complement of pretreatment liquid therefore, and raising curl and cock ring of a recorded material. The cationic high molecular compound of this invention may be used independently, or two or more sorts may be mixed and used for it.

[0086] In order to make it react with anionic compounds, such as a color in recording ink, and a dispersant of a pigment, and to raise image quality, it is most desirable to use the above cationic high molecular compounds. However it is also effective to add the monomer compound to which react to with the following anionic compounds and solubility and dispersibility are made to fall in pretreatment liquid, and it is desirable by using together especially with a cationic high molecular compound at the point that the reaction of a cationic high molecular compound and the anionic compound in recording ink is promoted.

[0087]

[Formula 57]



(Alkyl group whose sum totals of the carbon number of R₂₄, R₂₅, and R₂₆ of anions, such as halogen ion, nitrate ion, nitrite ion, and acetic-acid ion, and R₂₄-R₂₆ are 5-32 as for X-).

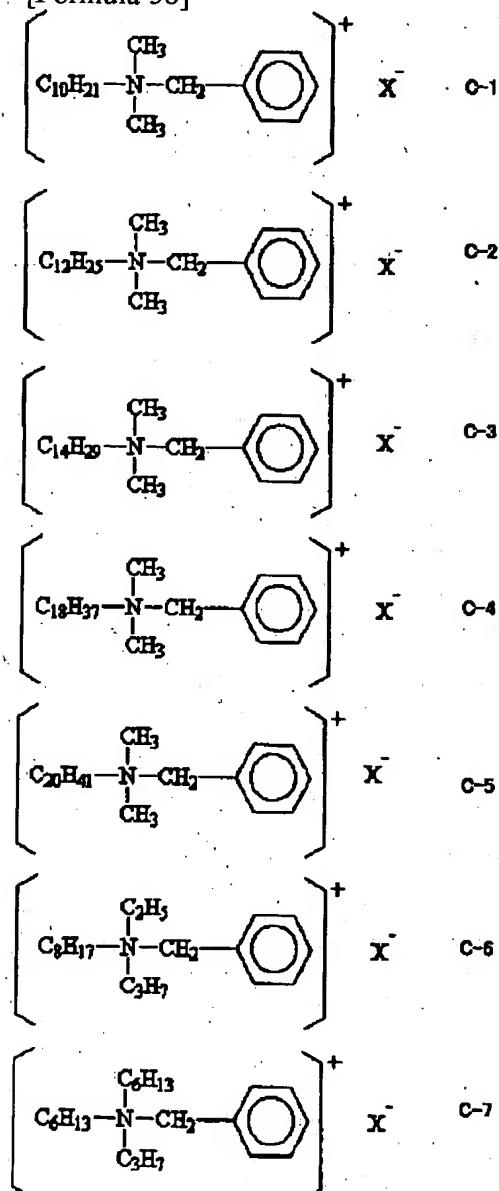
[0088] In the above-mentioned cationic monomer compound, solubility is equipped with both sides that it is high and

the effectiveness of making solubility and dispersibility falling at a reaction with the anion compound in recording ink is also high, and the compound both R25 and whose R26 are methyl groups and whose R24 is carbon numbers 10-20 has it. [desirable] When R25 and R26 are alkyl groups with more carbon numbers than a methyl group or the compound with which the carbon number of R1 exceeds 10-20 is used, the solubility in pretreatment liquid is missing and problems, such as producing precipitate, are produced by preservation or the environmental variation. Although excelled in dissolution stability with a compound with a small carbon number, the capacity to make solubility and dispersibility fall at a reaction with the anionic compound in recording ink is small, and the effectiveness of improving image quality is small.

[0089] The following structure compounds can be illustrated as an example from that of the cationic monomer compound shown by the above-mentioned general formula. the pretreatment liquid of this invention -- these cationic compounds -- independence -- or it can mix and use.

[0090]

[Formula 58]



[0091] If these cationic compound can use a commercial thing and a trade name shows concretely, Cation S, Cation SK, Cation M, cation G-50 (above, Mitsuhiro formation make), and cation F2-35R, cation F2-40E, cation M2-100, cation S2-100 (above, Nippon Oil & Fats make), SANIZARU C, SANIZORU B-50 (above, Kao make), etc. will be mentioned.

[0092] Although it is desirable to use together and use a cationic high molecular compound and a top-type compound

for pretreatment liquid, an upper-type compound has moderate surface activity ability, and it is presumed for making uniform wettability of pretreatment liquid to a recorded material. When common recording ink is given to the paper of fine quality which is a typical recorded material, the place which is easy to get wet in recording ink according to distribution of a surface sizing compound etc. microscopically, and the place which cannot get wet easily exist, and that from which it produces the image quality fall of a blot, the concentration unevenness of the solid image section, etc. is presumed. Since irregular **** decreases by making recording ink adhere to a recorded material after giving pretreatment liquid at "homogeneity" to recorded materials, such as a regular paper, it is the high definition which excels [ring / feather] in the repeatability of a thin line etc. few, and does not have a color boundary blot, and an image with high image concentration can be obtained.

[0093] Furthermore, pretreatment liquid with compatibility high [the monomer cationic compound shown by the upper formula] with the above-mentioned cationic high molecular compound and the high dependability which did not cause a deposit, separation, etc. in pretreatment liquid, but was excellent in preservation stability, the stability of coverage, etc. since uniform mixing was easy can be offered.

[0094] It is also effective to use the pretreatment liquid which made it dissolve in water etc. and the above-mentioned cationic high molecular compound was used as a compound to which the solubility in recording ink and distributed stability are made to fall, and also was distributed and the cation particle suspended. However, in order for the cation concentration in pretreatment liquid to become low and to fully raise image quality in a cationic emulsion, as for a water-soluble cationic high molecular compound, the cationic surface active agent which has a high-class alkyl group, it is desirable to have simultaneously with other cation compounds and to use.

[0095] The pigment dispersing element of the resin emulsion which has cationicity, cationic white, or a thin color is mentioned as an example of the liquid which was distributed and the cationic particle suspended. As an example of a cationic emulsion, it is styrene, such as akrit UW319-SX, akrit RKW-460, akrit RKW-400SX, akrit RKW-450SX, and akrit RKW-450 (above TAISEI chemically-modified incorporated company make), for example. - An acrylic cationic emulsion can obtain as a commercial item.

[0096] By adding a cationic resin emulsion in pretreatment liquid, a glossy image is obtained as compared with the case where the cationic high molecular compound which has water solubility is used independently, and the water resisting property of a high image and abrasion resistance can be given. Moreover, the lightfastness of an image can also be raised by making the ultraviolet ray absorbent, the anti-oxidant, the quencher, etc. contain into an emulsion.

[0097] The dispersing element of the silica which has cationicity can be illustrated as another example of the liquid which was distributed and the cationic particle suspended. The silica sol which is the dispersing element of the spherical silica around 0.1 micrometers distributed in water is used preferably. As a cationic silica, they are the Snowtex AK (Nissan Chemical Industries, Ltd. make) and SMR8-17-109SMSG, for example. 3CS (Grace Japan, Inc. make) CEP10AK97002 (product made from CABOT), etc. can obtain as a commercial item. however, the case where a cationic silica is used -- also setting -- a cationic silica -- if independent, the cation concentration in pretreatment liquid tends to become low like a cationic resin emulsion -- in order to come out, to be and to fully raise image quality, as for a water-soluble cationic high molecular compound, the cationic surface active agent which has a high-class alkyl group it is desirable to have simultaneously with other cation compounds and to use. By adding a cationic silica in pretreatment liquid, the feeling of stickiness immediately after image printing can be reduced as compared with the case where the cationic high molecular compound which has water solubility is used independently.

[0098] It is also effective in pretreatment liquid to use polyvalent metallic salt as a compound to which the solubility of recording ink and dispersibility are made to fall. However, since the capacity to fall the solubility of recording ink and dispersibility is generally a little weak as compared with a cationic high molecular compound, when using polyvalent metal, it is important for polyvalent metallic salt what kind of anionic compound is used for recording ink. When using polyvalent metallic salt, it is desirable to use the color which has three carboxyl groups or a sulfonic group preferably into [two or more] a monad. Moreover, if it is recording ink which used the pigment, it is desirable to use the pigment which introduced the carboxyl group by covalent bond, using as a dispersant the high molecular compound which has a carboxyl group. If it uses a color for recording ink in using polyvalent metallic salt for pretreatment liquid, a complex will be formed between a color and a metal and the lightfastness of the recorded image will improve.

[0099] As polyvalent metallic salt, an aluminum chloride, a calcium chloride, an aluminium nitrate, a magnesium nitrate, a magnesium chloride, a calcium nitrate, a magnesium hydroxide, an aluminum sulfate, ammonium alum, etc. can be used. A magnesium nitrate and 6 hydrate, magnesium acetate and 4 hydrate, a calcium nitrate and 4 hydrate, calcium acetate and monohydrate, a calcium chloride and an anhydride, a calcium lactate and 5 hydrate, formic acid calcium and an anhydride, magnesium benzoate and 3 hydrate, magnesium sulfate and 7 hydrate, etc. are still more specifically mentioned.

[0100] As a class of cationic compound which insolubilizes a coloring agent, in addition to a cationic high molecular compound given in the above-mentioned (27) - (45) term Dicyandiamide formalin ******, dicyandiamide diethylenetriamine ******, An epichlorohydrin dimethylamine addition polymerization object, dimethyl diaryl ammonium KURORAIDO and SO₂ copolymerization object, A dimethyl diaryl ammonium KURORAIDO polymerization object, the polymerization object of a diaryl amine salt and SO₂ copolymerization object allylamine salt, The 4th class salt polymerization object of a dialkyl aminoethyl (meta) AKURU rate, the poly allylamine, It is also possible to contain a cation epoxy resin, polyethyleneimine, polyacrylamide, Pori (meta) acrylic ester, a polyvinyl formamide, a cation emulsion, etc. polyvalent metallic salt, etc.

[0101] These cationic high molecular compound can use a commercial thing. Specifically SANSUTATTO E-818, SANFIKKUSU 70, SANFIKKUSU 555C, SANFIKKUSU LC-55, Sun Fuchs PAC-700 concentrated ** SANYOU Erion A-3, SANFIKKUSU 414, SANFIKKUSU 555, SANFIKKUSU PRO-100, SANFIKKUSU 555US, Cello pole YM-500 (above Sanyo Chemical Industries, Ltd. make), #675, #FR-2P, #1001 (above Sumitomo Chemical Co., Ltd. make), LUPASOL SC61B (BASF A.G. make) etc. is mentioned. Moreover, ZP-700 (vinyl formamide system), MP-184 (polyacrylic ester system), MP-173H (polymethacrylic-acid-ester system), MP-180 (polymethacrylic-acid-ester system), MX-0210 (polymethacrylic-acid-ester system), MX-8130 (polyacrylic ester system), E-395 (polyacrylic ester system), E-305 (polyacrylic ester system), Q-105H (dicyandiamide system), Neo-600 (polyacrylamide system), Q-101 (polyamine system), Q-311 (polyamine system), Q-501 (polyamine system), (-- the above -- Hymo Corp.) and the super flocks 2490 (polyacrylate system) -- The super flocks 3180, 3380, 3580, 3880, 3390, 3590, and 3500, SD2081 (polyacrylamide), AKOFU lock C498T, C498Y (polyacrylic ester system), the super flocks 1500 and 1600 and AKOFU locks C481, C483, C485, C488, and C480 (Pori methacrylic acid ester) The AKOFU locks C567, C573, C577, and C581 (polyamine system), (-- the above --) made from Mitsui SAITEKKU, Inc. PAS-A-1, PAS-A-5, and PAS-A-120L -- PAS-A-120S, PSA-J-81, PAS-880, PAS-92 (diaryl dimethylammonium salt system copolymerization object), PAS-H-5L PAS-H-10L, PAS-M-1 (diaryl dimethylammonium salt system polymerization object), PAA-HCl-3L, PAA-HCl-10L (poly allylamine hydrochloride), PAA-10C (poly allylamine) (above Nitto Boseki make), etc. are mentioned.

[0102] in addition -- as the cationic quarternary ammonium salt which can be used for this invention -- Io -- a network D46 and Io -- Network LEC, SEKURIRU VN, SANSUTATTO 1200, SANSUTATTO KT-305C, a cation G-50, and Io -- network RK-15 (above Sanyo Chemical Industries, Ltd. make) etc. is mentioned.

[0103] As for the reactivity of the cationic high molecular compound in pretreatment liquid, and the anionic component in recording ink, it is desirable to print with recording ink by the liquid phase, before pretreatment liquid dries after a grant means to contact gives pretreatment liquid to a recorded material, since it is the most efficient. If high reactivity is securable, there will be still less amount of the pretreatment liquid used, it will end, and it will become possible to raise image quality, without producing curl of a recorded material, and a cock ring. As coating weight to the recorded material of the pretreatment liquid of a recorded material, 0.5g/m² - 10 g/m² is desirable, and, thereby, can suppress curl of a recorded material better. If [than 10 g/m²] more [an image quality improvement effect is inadequate in their being less than two 0.5 g/m and], a recorded material produces curl and a cock ring, and since there is too much coating weight, strike-through concentration will increase.

[0104] In order to adjust to desired viscosity, pretreatment liquid can contain various solvents. As a solvent, it excels in the solubility of the above-mentioned cationic high molecular compound, and especially water is desirable from the safety of pretreatment liquid, and the point of cost. As for the content of water, it is desirable that it is 5 - 80 % of the weight. At less than 5 % of the weight, it is hard to dissolve cationic resin in stability, if larger than 80 % of the weight, it will become easy to produce an image blot, and will become easy to produce curl of a recorded material, and a cock ring, and it is not desirable.

[0105] In the pretreatment liquid of this invention, it is still more desirable to contain water and a water-soluble liquefied compound 20 to 80% of the weight. At less than 20 % of the weight, the effectiveness which controls that moisture evaporates from pretreatment liquid is small, viscosity change of the pretreatment liquid by moisture evaporation becomes large, and the stability of the amount of grants is missing. Moreover, by moisture evaporation, the dissolution stability of a cationic high molecular compound also worsens, pretreatment liquid gels or insoluble matter occurs. As a water-soluble liquefied compound, it is desirable to use a water-soluble solvent with the boiling point higher than water, and the same thing as the water-soluble organic solvent mentioned later can be illustrated.

[0106] Moreover, when using especially the pretreatment liquid of this invention with the grant equipment of a open system, the content of water has 40 or less desirable % of the weight. Especially a desirable thing is 10 - 30% of the weight of the range. If a moisture content exceeds 40 % of the weight, when moisture evaporates during the time of the grant to the recorded material of pretreatment liquid, and the neglect period of grant equipment, it will be easy to

produce the problem on which the viscosity of liquid rises, gelation is produced, or insoluble matter deposits. Moreover, moisture evaporates in time amount after giving pretreatment liquid until it performs image recording, the fluidity of pretreatment liquid is lost, a reaction with recording ink becomes slow, and the improvement effectiveness of sufficient image quality becomes hard to be acquired. Moreover, after giving pretreatment liquid, when there is time difference to image recording by a tip, the back end, etc. of an image, the problem that a difference will arise in image quality is also generated. The solubility of a cationic compound tends to become [a moisture content] inadequate at least less than 10% of the weight, and it is easy to produce the problem of gelation and generation of insoluble matter.

[0107] Although water is preferably used for the solvent of the pretreatment liquid of this invention, when using with the grant equipment of a open system as mentioned above, as compared with conventional pretreatment liquid, little direction is desirable [the addition of water] in order to maintain the grant stability to the recorded material of liquid. In this case, the presentation ratio of water is made fewer than the moisture ratio which the constituent excluding water from pretreatment liquid absorbs by the atmospheric humidity and the equilibrium in the operating environment of a recording device, or is made into the presentation ratio near it. Even if it not only can prevent by this that moisture evaporates during the time of the grant to the recorded material of pretreatment liquid, and the neglect period of grant equipment, but time amount after giving pretreatment liquid to a recorded material until it records an image becomes long with about 5 minutes, the improvement effectiveness of image quality equivalent to the case where image recording is performed immediately after grant can be acquired. When relative humidity makes it especially fewer than the amount of equilibrium moisture in RH 60%, even if the operating environment of the grant equipment of pretreatment liquid changes, it can prevent that problems, such as an ununiformity of grant by moisture evaporating and excess of the amount of grants, arise from pretreatment liquid in almost all operating environments.

[0108] A water-soluble organic solvent can be contained in the pretreatment liquid of this invention. If viscosity changes when solvent components, such as water in pretreatment liquid, evaporate, the amount of grants to a recorded material cannot change, either, and fixed image quality cannot be secured. Since the pretreatment liquid of a recorded material is made into desired physical properties in addition to desiccation prevention, the water-soluble organic solvent following for the purpose for making stability the coating property of the pretreatment liquid of a recorded material, in order to raise the dissolution stability of an additive in addition to this, the compound which insolubilizes the coloring agent in recording ink, and etc. can be used. The content of a water-soluble organic solvent has 5 - 70% of the weight of the desirable range. Less than 5 % of the weight of the effectiveness as a dissolution assistant is insufficient for the viscosity stabilization effectiveness list by evaporation reduction, and when [than .70 % of the weight] more, at it, it is not desirable in order to induce the strike-through of an image, and an image blot.

[0109] To the water-soluble organic solvent used for the pretreatment liquid of this invention Ethylene glycol, a diethylene glycol, triethylene glycol, A polyethylene glycol, a polypropylene glycol, 1,5-pentanediol, To 1, 6-hexanediol, a glycerol, 1 and 2, and 6-, KISAN triol, Polyhydric alcohol, such as 1, 2, 4-butane triol, 1 and 2, 3-butane triol, and PETORI oar Ethylene glycol monoethyl ether, ethylene glycol monobutyl ether, The diethylene-glycol monomethyl ether, diethylene glycol monoethyl ether, The diethylene-glycol monobutyl ether, the tetraethylene glycol monomethyl ether, Polyhydric-alcohol alkyl ether, such as the propylene glycol monoethyl ether Polyhydric-alcohol aryl ether, such as ethylene glycol monophenyl ether and ethylene glycol mono-benzyl ether, A N-methyl-2-pyrrolidone, an N-hydroxyethyl-2-pyrrolidone, Nitrogen-containing heterocyclic compounds, such as 2-pyrrolidone, 1, 3-dimethyl imidazolidinone, and epsilon caprolactam, Sulphur-containing compounds, such as amines, such as monoethanolamine, diethanolamine, and triethanolamine, a sulfolane, and thiodiethanol, propylene carbonate, ethylene carbonate, gamma-butyrolactone, etc. can be used. these solvents are independent in water -- or it can be used, mixing more than one.

[0110] As for the class and presentation ratio of the optimal water-soluble organic solvent used with the pretreatment liquid of this invention, it is desirable to be chosen according to other ingredients used for pretreatment liquid. Since the compound to which the solubility of recording ink, such as a cationic high molecular compound, and dispersibility are made to fall especially in this invention is used by high concentration, it is important to secure the solubility of the compound.

[0111] Especially a desirable thing in these A diethylene glycol, thiodiethanol, Polyethylene glycols 200-600, triethylene glycol, To a glycerol, 1 and 2, and 6-, KISAN triol, 1 and 2, 4-butane triol, PETORI oar, 1,5-pentanediol, a N-methyl-2-pyrrolidone, the solubility of the compound which insolubilizes [high molecular compound / cationic] by being N-hydroxyethyl pyrrolidone, 2-pyrrolidone, 1, and 3-dimethyl imidazolidinone, and using these -- it can maintain -- dependability -- it is high and pretreatment liquid can be given to a recorded material.

[0112] If an image is formed from breathing out recording ink as a drop and making it adhere to a recorded material

after it is desirable to make the pretreatment liquid of a recorded material contain monohydric alcohol furthermore, it can prevent generating of the spreading unevenness by foaming of the pretreatment liquid of a recorded material etc. by that cause and gives the pretreatment liquid of the recorded material in contact with a recorded material, the image which has uniform concentration can be obtained.

[0113] Since the pretreatment liquid of this invention is using water and a water-soluble solvent as the main solvent, it has a bad influence neither on the wettability of the recorded material and recording ink with which pretreatment liquid was given, nor permeability. Therefore, even if it performs high-speed record, good image quality can be acquired. Moreover, the various components which constitute the pretreatment liquid of this invention are stable, and also after saving at a long period of time, change is not produced at all in the property.

[0114] Furthermore, a surfactant can be contained in the pretreatment liquid of the recorded material of this invention. If recording ink is made to adhere to a recorded material after giving the pretreatment liquid containing cationic resin and a surfactant to recorded materials, such as a regular paper, since irregular **** by distribution of the surface sizing compound of a recorded material will decrease, it is the high definition which excels [ring / feather] in the repeatability of a thin line etc. few, and does not have a color boundary blot, and an image with high image concentration is obtained. This is considered to be for color material's insolubilizing and stopping near the front face of a recorded material while recording ink permeates a recorded material at homogeneity.

[0115] As a surface active agent, as an example, sodium dodecylbenzenesulfonate, Anionic surfactants, such as ammonium salt of lauryl acid sodium and polyoxyethylene-alkyl-ether sulfate, Chlorination distearyltrimethylbenzylammonium, stearyltrimethylbenzylammonium chloride, Stearyltrimethylbenzylammonium chloride, stearyl chloride trimethylammonium, Chlorination cetyl trimethylammonium, chlorination millimeter still dimethylbenzyl ammonium, A benzalkonium chloride, ethyl-sulfuric-acid lanolin fatty-acid aminopropyl ethyl dimethylammonium, Amphoteric surface active agents, such as cation system surfactants, such as chlorination JIDESHIRU dimethylammonium, and an imidazoline derivative, Polyoxyethylene alkyl ether, polyoxyethylene alkyl phenyl ether, Polyoxyethylene alkyl ester, polyoxyethylene alkylamine, Polyoxyethylene alkylamide, polyoxyethylene propylene block polymer, The Nonion system surfactants, such as a sorbitan fatty acid ester, polyoxyethylene sorbitan fatty acid ester, and an ethyleneoxide additive of acetylene alcohol, a fluoroochemical surfactant, etc. are mentioned.

[0116] As a content of the surfactant in pretreatment liquid, 0.1 - 50 % of the weight is desirable. Moreover, especially in order to secure the homogeneity of pretreatment liquid, a cationic surface active agent is desirable among surface active agents. Thereby, while raising the wettability on recording ink and the front face of a recorded material, the image which is high definition and was excellent in the water resisting property with high image concentration is obtained. as a cationic surfactant -- Io -- a network D46 and Io -- Network LEC, SEKURIRU VN, SANSUTATTO 1200, SANSUTATTO KT-305C, a cation G-50, and Io -- network RK-15 (above Sanyo Chemical Industries, Ltd. make) etc. is mentioned.

[0117] The place which examined the permeability of the recording ink to recorded materials, such as a regular paper, By using the pretreatment liquid of the recorded material containing the cation student high molecular compound who reduces the solubility of the specific surface active agent expressed with general formula [of a publication] (6) - (11) to the above-mentioned (51) term, and the coloring material in recording ink, or dispersibility The image which is the high definition which the permeability of the recording ink to a recorded material can improve, and can stop a color on a recorded material front face, excels [ring / feather] in the repeatability of a thin line etc. few, and does not have a color boundary blot, and was excellent in the water resisting property with high image concentration is obtained. At this time, it is desirable to make into 90 or less degrees the contact angle of the recording ink which adheres to the recorded material after pretreatment liquid grant of a recorded material especially, and it is still more desirable that the surface tension of recording ink considers [the surface tension of the pretreatment liquid of a recorded material] as 20 - 40 mN/m by 40 - 60 mN/m.

[0118] Furthermore, according to this invention, when the permeability of the recording ink to a recorded material improves, the fixing quick dry rate of an image becomes quick, and, thereby, high-speed record can be performed. If this makes recording ink adhere to a recorded material after giving the pretreatment liquid of the recorded material containing the cationic high molecular compound to which the solubility of the above-mentioned specific surface activ agent and the coloring material in recording ink or dispersibility is reduced to recorded materials, such as a regular paper, since its irregular **** by distribution of the surface sizing compound of a recorded material will decrease, it is considered to be for a coloring material's insolubilizing and stopping near the front face of a recorded material while recording ink permeates a recorded material at homogeneity.

[0119] As a content of the surfactant expressed with above-mentioned general formula (6) - (11) in the pretreatment liquid of a recorded material, 0.1 - 10 % of the weight is more preferably good 0.1 to 50% of the weight. Moreover, the

benzalkonium chloride salt of the cationic surface active agent expressed with a general formula (6) especially among surface active agents is desirable. By this, the wettability on recording ink and the front face of a recorded material can be raised more, it can osmosis speed up [of the recording ink to a recorded material] more, and the image which is high definition and was excellent in the water resisting property with high image concentration is obtained, and high-speed record can be performed.

[0120] the pretreatment liquid of this invention -- a surfactant -- and/or, it gets wet, and an accelerator can be added and used. In this case, it is desirable to raise the wettability to the grant means used in order that that surface tension may be adjusted to 40 or less mN/m by coincidence and may give a recorded material and pretreatment liquid to it. Since pretreatment liquid adheres to a recorded material by raising wettability at homogeneity, it becomes possible in the small amount of grants to raise image quality. Moreover, uniform spreading to a recorded material becomes easy by raising the wettability to liquid grant means, such as a rubber roller and a metal roller.

[0121] Although it gets wet other than a surfactant in order to adjust surface tension as mentioned above, and an accelerator can be added As solvents other than a surface active agent being concrete, the diethylene-glycol monophenyl ether, Ethylene glycol monophenyl ether, ethylene glycol monoallyl ether, The diethylene-glycol monophenyl ether, the diethylene-glycol monobutyl ether, Alkyl and aryl ether of polyhydric alcohol, such as the propylene glycol monobutyl ether and the tetraethylene glycol chlorophenyl ether, 1,6-hexanediol, 1,5-pentanediol, 2-ethyl -1, 3-hexandiol; 2, 2, 4-trimethyl -Lower alcohol, such as polyhydric alcohol, such as 1, 3-pentanediol, 2-ethyl -1, and 3-hexandiol, a polyoxyethylene polyoxypropylene block copolymer, ethanol, and 2-propanol, is mentioned.

However, if it dissolves into pretreatment liquid and can adjust to desired physical properties, it will not restrict to this.

[0122] Moreover, in the pretreatment liquid of the recorded material of this invention, it is desirable to add binder resin for the reason on a fixing disposition. As binder resin, acrylic resin, vinyl acetate system resin, styrene-butadiene system resin, vinyl chloride system resin, acrylic-styrene resin, butadiene system resin, styrene resin, etc. are mentioned.

[0123] Furthermore, in the pretreatment liquid of this invention, it is desirable to contain 0.1 - 5% of the weight of antiseptics and/or an antifungal agent. Since pretreatment liquid is given making a recorded material contact, a contamination causative agent like paper powder is easy being mixed, pretreatment liquid is deteriorated, and the coating weight change by deterioration and the fall of the image quality improvement effect itself may be done. Then, pretreatment which can act on stability for a long period of time can be obtained by adding 0.1 - 5% of the weight of preservation from decay and an antifungal agent. As a preservation-from-decay antifungal agent, sodium benzoate, pentachlorophenol sodium, 2-pyridine thiol-1-oxide sodium, sodium sorbate, sodium-dehydroacetate, 1, and 2-JIBENJISO thiazoline-3-ON (the pro cheating on the fare CRL of ABISHA, the pro cheating on the fare BDN, pro cheating on the fare GXL) etc. can be used. At less than 0.1 % of the weight, the preservation from decay and antifungal effect of an addition are inadequate, and when [than 5 % of the weight] more, it reduces image quality.

[0124] As for the pH value of pretreatment liquid, being mostly maintained at neutrality is desirable. Although a pH value is desirable in the semantics which suppresses corrosive [the] when maintaining at the range of 8-11 uses stainless steel and nickel as a liquid grant member, the solubility of cation resin has the high field where a pH value is general comparatively low, and is desirable from both balance. [of the field near neutrality] In order to adjust the pH value of pretreatment liquid to a desired value, in pretreatment liquid, the carbonate of alkali metal, such as the hydroxide of alkali metals, such as amines, such as diethanolamine and triethanolamine, a lithium hydroxide, a sodium hydroxide, and a potassium hydroxide, ammonium hydroxide, the 4th class ammonium hydroxide, the 4th class phosphonium hydroxide, a lithium carbonate, a sodium carbonate, and potassium carbonate, etc. can be added.

[0125] In addition, in order to improve the lightfastness of an image, an ultraviolet ray absorbent, an antioxidant, etc. can also be added in pretreatment liquid. As an ultraviolet-rays inhibitor, various kinds of benzotriazol systems, a salicylate system, a benzophenone system, a cyanoacrylate system, a benzofuran derivative, a permutation acrylonitrile system, a permutation-N-phenylamino ethylene system, a pyrone system, methylene malonic ester, cinnamate, a phenyl-salicylate system, a hindered amine system, etc. are mentioned suitably. As an antioxidant, various kinds of phenol systems, a sulfur system, a phosphoric-acid system, a naphthol system, HINDATO phenols, p-phenylenediamines, hydroquinone, organosulfur compounds, organic phosphorous compounds, a HINDATO amine, a chroman system, a SUPIRO in out system, a hydrazine, etc. are mentioned suitably. These ultraviolet-rays inhibitor and the anti-oxidant may be added as an emulsion in order to raise dispersibility.

[0126] Next, recording ink is explained. There is no need that the recording ink which can be used for this invention is not necessarily water recording ink. Moreover, it is the description to give the pretreatment liquid which contains in high concentration the compound to which the dispersibility of recording ink and solubility are reduced to a recorded material, and this invention does not have the need that the compound of ionicity is included in recording ink, either.

However, an anionic color or an anionic pigment is used for current and the common recording ink for ink jets as above-mentioned. Although the presentation of the recording ink used was not limited in this invention, as for effectiveness, it is largest to use in the combination of the recording ink using an anionic color material generally used and the pretreatment liquid containing a cationic compound.

[0127] The anionic components in recording ink are an anionic color, the pigment distributed with the anionic dispersant or a color, the pigment which has an anionic radical, and at least one coloring agent chosen from an anionic coloring particle. Since it has the anionic radical as a functional group in the coloring agent or the anionic component is sticking to a coloring agent, by the reaction of an anionic component and cationic resin, the coloring component in recording ink can be efficiently limited to a recorded material surface, and, therefore, various image quality improvement effects, such as improvement in image concentration, strike-through concentration reduction, and a feather ring, boundary blot prevention, are acquired.

[0128] As recording ink used for the record approach of this invention As a color, it sets to a Color Index. Acid dye, a substantivity color, reactive dye, The water soluble dye classified into the food color, More specifically as acid dye and the food color C. The I. acid . yellow 17, 23, 42, and 44, 79,142;C.I. acid . red 1, 8, 13, 14, 18, 26, 27, 35, 37, 42, 52, 82, 87, 89, 92, 97, 106, 111, 114, 115, 134, 186, and 249, 254, the 289;C.I. acid . blues 9, 29, 45, and 92, the 249;C.I. acid . blacks 1, 2, 7, 24, and 26, the 94;C.I. hood . yellow 3, the 4;C.I. hood . red 7 and 9, 14;C.I. hood . blacks 1 and 2;

[0129] As a substantivity color C. The I. direct . yellow 1, 12, 24, 26, 33, 44, and 50, the 86,120,132,142,144;C.I. direct . red 1, 4, 9, 13, 17, 20, 28, 31, 39, 80, 81, and 83, 89,225,227; C. I. direct . Orange 26 and 29, 62,102; C. The I. direct . blues 1, 2, 6, 15, 22, 25, 71, 76, 79, 86, 87, and 90, 98,163,165,199,202;C.I. direct . blacks 19, 22, 32, 38, 51, 56, 71, 74, 75, 77, 154, and 168, 171;

[0130] As basic dye C. The I. BASIC . yellow 1, 2, 11, 13, 14, 15, 19, 21, 23, 24, 25, 28, 29, 32, 36, 40, 41, 45, 49, 51, 53, 63, 64, 65, 67, 70, 73, 77, and 87, 91; C. The I. BASIC . red 2, 12, 13, 14, 15, 18, 22, 23, 24, 27, 29, 35, 36, 38, 39, 46, 49, 51, 52, 54, 59, 68, 69, 70, 73, and 78, 82,102,104,109,112; C. The I. BASIC . blues 1, 3, 5, 7, 9, 21, 22, 26, 35, 41, 45, 47, 54, 62, 65, 66, 67, 69, 75, 77, 78, 89, 92, 93, 105, 117, 120, 122, 124, 129, 137, 141, and 147, 155; C. I. BASIC . blacks 2 and 8;

[0131] As reactive dye C. The I. reactive . blacks 3, 4, 7, 11, and 12, 17; C. The I. reactive . yellow 1, 5, 11, 13, 14, 20, 21, 22, 25, 40, 47, 51, 55, and 65, the 67;C.I. reactive . red 1, 14, 17, 25, 26, 32, 37, 44, 46, 55, 60, 66, 74, 79, and 96, 97; C. The I. reactive . blues 1, 2, 7, 14, 15, 23, 32, 35, 38, 41, 63, and 80 and 95 grades can be used.

[0132] Especially in this invention, anionic acid dye and an anionic substantivity color can use preferably. Moreover, it is also desirable to use the color developed for ink jets, and it is Projet made from ABISHA as such a color, for example. FastBlack2, Projet Fast Cyan2, Projet FastMagenta2, Projet Fast Yellow2 etc. is mentioned.

[0133] Also when the image recording approach of this invention and pretreatment liquid applied not only the recording ink that makes a color color material but a pigment to the recording ink made into color material, big effectiveness was observed in respect of improvement in image quality etc. An inorganic pigment and an organic pigment can be used especially for the pigment used for this invention, without limiting the class.

[0134] In addition to titanium oxide and an iron oxide, as an inorganic pigment, the carbon black manufactured by well-known approaches, such as the contacting method, the furnace method, and thermal **, can be used. Moreover, as an organic pigment, an azo pigment (an azo lake, insoluble azo pigment, a disazo condensation pigment, a chelate azo pigment, etc. are included), polycyclic type pigments (for example, a phthalocyanine pigment, a ** RIREN pigment, a ** RINON pigment, an anthraquinone pigment, a quinacridone pigment, a dioxazine pigment, a thioindigo pigment, an isoindolinone pigment, a kino FURARON pigment, etc.), color chelates (for example, a basic dye mold chelate, an acid-dye mold chelate, etc.), a nitro pigment, a nitroso pigment, aniline black, etc. can be used.

[0135] Concretely, as an object for black, organic pigments, such as metals, such as carbon black (C. I. pigment black 7), such as furnace black, lamp black, acetylene black, and channel black, or copper, iron (C. I. pigment black 11), and titanium oxide, and aniline black (C. I. pigment black 1), are raised.

[0136] As an object for colors, concretely The C.I. pigment yellow 1 (fast yellow G), 3, 12 (Diarylide Yellow AAA), 13, 14, 17, 24, 34, 35, 37, 42 (Synthetic Ochre), 53, 55, 81, 83 (Diarylide Yellow HR), 95, 97, 98, 100, 101, 104, 408, 109, 110, 117, 120, 138, 153;C.I. pigment Orange 5, 13, 16, 17, 36, and 43, the 51;C.I. pigment red 1, 2, 3, 5, 17, and 22 A (brilliant farce toss caret), 23, 31, 38, 48:2 (Permanent Red 2B (Ba)), 48:2 (Permanent Red 2B (calcium)) 48:3 (Permanent Red 2B (Sr)), 48:4 (Permanent Red 2B (Mn)), 49:1, 52:2, 53:1, 57:1 (brilliant carmine 6B), 60:1, 63:1, 63:2, 64:1, 81 (rhodamine 6G lake), 83, 88,101 (red oxide), 104, 105, 106, 108 (cadmium red), 112, 114, 122 (Quinacridone Magenta), 123, 146, 149, 166, 168, 170, 172, 177, 178, 179, 185, 190, 193, 209, the 219;C.I. pigment violet 1 (rhodamine lake), 3, 5:1, 16, 19, 23, 38, the C.I. pigment blues 1, 2, and 15 (copper phthalocyanine blue R), There are 15:1, 15:2, 15:3 (copper phthalocyanine blue E), 16, 17:1, 56, 60, 63;C.I. pigment Green 1, 4, 7, 8, 10, 17,

and 18, and 36 grades.

[0137] What has the good water and the compatibility among these pigments is used preferably. 0.05 to 10 micrometer or less are 1 micrometer or less desirable still more preferably, and the particle size of a pigment is 0.16 micrometers or less most preferably. Moreover, the addition of the pigment as a coloring agent in ink has about 0.5 - 25 desirable % of the weight, and it is about 2 - 15 % of the weight more preferably.

[0138] As for these pigments, what was distributed with the anionic dispersant is desirable. As an anionic dispersant, a polyacrylic acid, polymethacrylic acid, and acrylic-acid-acrylonitrile copolymer, A vinyl acetate-acrylic ester copolymer, an acrylic-acid-acrylic-acid alkyl ester copolymer, A styrene-acrylic-acid copolymer, a styrene-methacrylic-acid copolymer, A styrene-acrylic-acid-acrylic-acid alkyl ester copolymer, a styrene-methacrylic-acid-acrylic-acid alkyl ester copolymer, A styrene-alpha-methyl-styrene-acrylic-acid copolymer, a styrene-alpha-methyl-styrene-acrylic-acid copolymer-acrylic-acid alkyl ester copolymer, A styrene-maleic-acid copolymer, a vinyl naphthalene-maleic-acid copolymer, A vinyl acetate-ethylene copolymer, a vinyl acetate-fatty-acid vinyl ethylene copolymer, a vinyl acetate-maleate copolymer, a vinyl acetate-crotonic-acid copolymer, a vinyl acetate-acrylic-acid copolymer, etc. are mentioned. The well-known anionic dispersant used for adjusting conventionally well-known pigment dispersion liquid besides these can be used.

[0139] the desirable voice of this invention -- if it depends like, the weight average molecular weight of these copolymers will be 3,000-50,000 -- desirable -- more -- desirable -- 5,000-30,000 -- it is 7,000-15,000 most preferably. The addition of a dispersant makes stability distribute a pigment and *** addition may be carried out in the range which does not make other effectiveness of this invention lose. As a dispersant, the range of 1:0.06-1:3 is desirable, and the range of it is 1:0.125-1:3 more preferably. It is desirable to be added by ink as pigment dispersion liquid which the pigment made distribute a pigment in an aquosity medium with a dispersant, and were obtained in these cases.

[0140] In addition, the front face of a pigment (for example; carbon) is processed by resin etc., and the graft pigment whose distribution was enabled underwater, the processing pigment whose distribution added functional groups, such as a sulfone radical and a carboxyl group, to the front face of a pigment (for example, carbon), and was enabled underwater can be used. Moreover, a microcapsule may be made to include a pigment and this pigment may be made into what can be distributed underwater.

[0141] The recording ink which made the pigment distribute with the anionic surfactant other than an above-mentioned macromolecule dispersant is also desirable to the record approach of this invention. For example, an oleyl acid and its salt, a lauryl acid and its salt, behenic acid, and its salt, Fatty acids, such as stearin acid and its salt, and the salt of those, a dodecyl sulfonic acid, and its salt, A DESHIRU sulfonic acid and its salt, an alkyl sulfonic acid, its salt, a lauryl sulfate, Alkyl-sulfuric-acid esters, dodecylbenzenesulfonic acid, and its salts, such as an oleyl sulfate, Alkylbenzene sulfonic acid and its salts, such as lauryl benzenesulfonic acid and its salt, Dialkyl sulfo succinic acid, such as dioctyl sulfo succinic acid and its salt, dihexyl sulfo succinic acid, and its salt, and the salt of those, Aromatic series anion system surfactants, such as a naphthyl sulfonic acid and its salt, a naphthyl carboxylic acid, and its salt, A pigment can be distributed using fluorine system anionic surfactants, such as a fluorination alkyl carboxylic acid and its salt, a fluorination alkyl sulfonic acid, and its salt, etc., and it can use for recording ink.

[0142] Pigments, such as carbon, and the diazonium compound which has a hydrophilic group moreover, by radical reaction Carry out covalent bond of the direct hydrophilic group to a pigment, or only the front face of pigments, such as carbon, by oxidation reaction The recording ink using the pigment which gave ionicity by the surface qualification reaction of the pigment itself, such as introducing a carboxylic-acid radical, or making a pigment and an oleum react and introducing a sulfonic group into a pigment front face, without using a dispersant is recording ink very advantageous although the effectiveness of this invention is acquired.

[0143] Although there is especially no limit in the particle size of a pigment when using the recording ink which distributed the pigment, it is desirable in this invention to use the pigment ink of the particle size whose maximum frequency is 20-150nm by maximum number conversion. If particle size exceeds 150nm, the pigment-content powder stability as recording ink becomes [it not only worsens, but / the regurgitation stability of recording ink also deteriorates and / image quality, such as image concentration] low and is not desirable. Although high image quality is also acquired when the preservation stability of recording ink and the injection property in a printer are stabilized by particle size in less than 20nm and it uses pretreatment liquid, it becomes complicated distributed actuation and classification operating to make even a particle size fine such distribute, and it becomes difficult to manufacture recording ink economically.

[0144] As a mode of still more nearly another recording ink applicable to the record approach of this invention, the recording ink which the coloring resin particle suspended can be mentioned. A coloring resin particle colors styrene-acrylic resin, polyester resin, polyurethane resin, etc. with fat dye, a disperse dye, or a pigment. An anionic coloring

particle can obtain the recording ink which suspended water on the solvent object made into a subject by forming the part which is equivalent to the husks of a particle by the resin which has the hydrophilic property of polyacrylic acid, polymethacrylic acid, etc., or suspending with the surfactant which has ionicity, such as a reactant surfactant.

[0145] The resin emulsion of negative electrification may be added to the recording ink used for the record approach of this invention. By making recording ink contain the resin emulsion of negative electrification, with pretreatment liquid, not only color material but a resin emulsion controls osmosis in the interior of a recorded material of coloring components, such as a lifting and color material, for remarkable thickening and agglutination, and has the effectiveness which promotes fixing to **-ed material further. Moreover, depending on the class of resin emulsion, a coat is formed on **-ed material, and it has the effectiveness of also raising the scuff resistance of printed matter, lightfastness, and a water resisting property.

[0146] A continuous phase is water and a resin emulsion means the emulsion whose dispersed phases are the following resinous principles. As a resinous principle of a dispersed phase, acrylic resin, vinyl acetate system resin, styrene-butadiene system resin, vinyl chloride system resin, acrylic-styrene resin, butadiene system resin, styrene resin, etc. are raised.

[0147] As for this resin, according to the desirable mode of this invention, it is desirable that it is a polymer having a hydrophilic part and a hydrophobic part. Moreover, although it is not limited especially as long as the particle diameter of these resinous principles forms an emulsion, about 150nm or less is desirable, and is about 5-100nm more preferably.

[0148] These resin emulsions can be obtained by mixing a resin particle in water with a surfactant by the case.

[0149] As a commercial resin emulsion, the micro gel E-1002, E-5002 (a styrene-acrylic resin emulsion, Nippon Paint Co., Ltd. make), BONKOTO 4001 (an acrylic resin emulsion, Dainippon Ink & Chemicals, Inc. make), BONKOTO 5454 (a styrene-acrylic resin emulsion, Dainippon Ink & Chemicals, Inc. make), SAE-1014 (a styrene-acrylic resin emulsion, Nippon Zeon Co., Ltd. make), SAIBI Norian SK-200 (an acrylic resin emulsion, SAIDEN CHEMICAL INDUSTRY CO., LTD. make), etc. are mentioned.

[0150] It is 1 - 25% of the weight of the range preferably [a resin emulsion / adding so that the resinous principle may become 0.1 - 40% of the weight of recording ink] among recording ink, and more preferably.

[0151] When recording ink is water solubility, a hydrophilic high molecular compound can be added in the recording ink used for the record approach of this invention, and the effectiveness which promotes the dispersibility of recording ink and a soluble fall with the pretreatment liquid containing a cationic compound can be acquired by adding an anionic water soluble polymer compound especially to it.

[0152] As a hydrophilic high molecular compound which can be added to recording ink By the natural system, gum arabic, TORAGANGAMU, good AGAMU, karaya gum, Vegetable macromolecules, such as locust bean gum, arabino GARA KUTON, pectin, and KUINSU seed starch, Seaweed system giant molecules, such as an alginic acid, a carrageenan, and an agar, gelatin, casein, A microorganism system giant molecule or shellacs, such as animal system giant molecules, such as albumin and a collagen, xanthene gum, and a dextran etc., By the semisynthesis system, methyl cellulose, ethyl cellulose, hydroxyethyl cellulose, Fibrin system macromolecules, such as hydroxypropylcellulose and a carboxymethyl cellulose, Starch system macromolecules, such as sodium carboxymethyl starch and sodium starch phosphate, Seaweed system macromolecules, such as sodium alginate and propylene glycol alginate, By the pure composition system, vinyl system macromolecules, such as polyvinyl alcohol, a polyvinyl pyrrolidone, and polyvinyl methyl ether, The polyacrylamide non-constructing a bridge, polyacrylic acid, and its alkali metal salt, Acrylic resin, such as water-soluble styrene acrylic resin, water-soluble styrene maleic resin, The alkali metal salt of water-soluble vinyl naphthalene acrylic resin, water-soluble vinyl naphthalene maleic resin, a polyvinyl pyrrolidone, polyvinyl alcohol, and beta-naphthalene sulfonic-acid formalin condensate etc. is mentioned.

[0153] Moreover, a recording ink constituent may contain sugar. As an example of a saccharide, monosaccharide, disaccharide, oligosaccharide (trisaccharide and tetrasaccharide are included), and polysaccharide are raised, and a glucose, a mannose, a fructose, a ribose, a xylose, arabinose, a galactose, a maltose, a cellobiose, a lactose, a sucrose, trehalose, a maltotriose, etc. are raised preferably. Here, polysaccharide means the sugar of a wide sense and suppose that it uses for the semantics containing the matter which exists in natures, such as alpha-cyclodextrin and a cellulose, widely.

[0154] Moreover, as a derivative of these saccharides, they are the reducing sugar (for example, sugar-alcohol (general formula HOCH₂(CHOH) nCH₂ it is expressed with OH (the integer of n=2-5 is expressed here.)), oxidization sugar, amino acid (for example, aldonic acid, uronic acid, etc.), a thio acid, etc. are raised.) of the above mentioned saccharide. Especially sugar-alcohol is desirable and maltitol, sorbitol, etc. are raised as an example. the content of these saccharides -- a recording ink constituent -- 0.5 - 30% of the weight of the range is preferably suitable 0.1 to 40%

of the weight.

[0155] Osmosis accelerators, such as a surfactant, can be added in the recording ink used for the record approach of this invention, the surface tension of recording ink can be adjusted to it by that cause, and the regurgitation stability of recording ink can be improved by improving the permeability over a recorded material and raising the wettability of recording ink to the head member of an ink jet printer.

[0156] Especially the recording ink that raised the permeability over a recorded material fits high-speed record. By the ink jet record approach of not using conventional pretreatment liquid, when the permeability of recording ink was raised, it was easy to produce the strike-through of recording ink, and a feather ring, but by using the record approach of this invention, when high-speed record is carried out at a regular paper using the recording ink which raised permeability remarkably, a strike-through and a feather ring can be prevented.

[0157] Although especially the surface active agent that can be added to the recording ink used for the record approach of this invention is not limited, as an anionic surface active agent, the dodecylbenzenesulfonic acid salt, a lauryl sulfate polyoxyethylene-alkyl-ether acetate, polyoxyethylene-alkyl-ether sulfate, dialkyl sulfo succinate, etc. are mentioned, for example.

[0158] As a nonionic surfactant, the acetylene derivative embellished with polyoxyethylene alkyl ether, polyoxyethylene alkyl ester, polyoxyethylene sorbitan fatty acid ester, polyoxyethylene alkyl phenyl ether, polyoxyethylene alkylamine, polyoxyethylene alkylamide, and an ethylene oxide radical, a polyoxyethylene polyoxypropylene block copolymer, a fluorochemical surfactant, etc. are mentioned, for example.

[0159] Penetrating agents other than a surfactant can be added in order to adjust surface tension to recording ink. Moreover, as such a penetrating agent 2-ethyl -1, 3-hexandiol, 2 and 2, 4-trimethyl -1, 3-pentanediol, Which polyhydric alcohol, the diethylene-glycol monophenyl ether, Ethylene glycol monophenyl ether, ethylene glycol monoallyl ether, The diethylene-glycol monophenyl ether, the diethylene-glycol monobutyl ether, Alkyl and aryl ether of polyhydric alcohol, such as the propylene glycol monobutyl ether and the tetraethylene glycol chlorophenyl ether, Lower alcohol, such as a polyoxyethylene polyoxypropylene block copolymer, a fluorochemical surfactant, ethanol, and 2-propanol, is mentioned.

[0160] Since desiccation of recording ink is prevented as a solvent of recording ink in order to make recording ink into desired physical properties although water is used as a principal component, the water-soluble organic solvent shown a water-soluble organic solvent used for the pretreatment liquid of the above-mentioned recorded material for the purpose for raising the dissolution stability of a coloring agent etc. can be used. As a water-soluble desirable organic solvent, especially A diethylene glycol, thiodiethanol, polyethylene glycols 200-600, triethylene glycol, To glycerol, 1 and 2, and 6-, KISAN triol, 1 and 2, 4-butane triol, PETORI oar, 1,5-pentanediol, a N-methyl-2-pyrrolidone, N-hydroxyethyl-2-pyrrolidone, 2-pyrrolidone, 1, and 3-dimethyl imidazolidinone is mentioned, and the effectiveness which was excellent to prevention of the poor injection property by the high solubility of a coloring agent and moisture evaporation is acquired by using these.

[0161] Moreover, the additive for recording ink known conventionally can be added to the recording ink in this invention. For example, as a preservation-from-decay antifungal agent, sodium benzoate, pentachlorophenol sodium, 2 pyridine thiol-1-oxide sodium, sodium sorbate, sodium-dehydroacetate, 1, and 2-JIBENJISO thiazoline-3-ON (the pro cheating on the fare CRL of ABISHA, the pro cheating on the fare BDN, pro cheating on the fare GXL) etc. can be used. Addition of pH regulator, a rusr-proofer, etc. is possible not only in recording ink but pretreatment liquid.

[0162] If a bad influence can be adjusted to ***** and pH can be adjusted to the recording ink prepared as a pH regulator seven or more, the matter of arbitration can be used and the carbonate of alkali metal, such as the hydroxide of alkali metals, such as amines, such as diethanolamine and triethanolamine, a lithium hydroxide, a sodium hydroxide and a potassium hydroxide, ammonium hydroxide, the 4th class ammonium hydroxide, the 4th class phosphonium hydroxide, a lithium carbonate, a sodium carbonate, and potassium carbonate, etc. will be mentioned as the example. a chelate trial -- as easy, ethylenediaminetetraacetic acid sodium, nitrilotriacetic acid sodium, hydroxyethyl ethylenediamine triacetic-acid sodium, diethylenetriamine pentaacetic acid sodium, URAMIRU sodium diacetate, etc. are mentioned, for example. As a rusr-proofer, an acid sulfite, a sodium thiosulfate, thioglycolic acid Amon, a diisopropyl AMMONIUM nit light, pentaerythritol tetranitrate, a dicyclohexyl ammonium nit light, etc. are mentioned, for example.

[0163] In addition, according to the purpose, an ultraviolet ray absorbent, an infrared absorption agent, an antioxidant, etc. can also be added. As an ultraviolet-rays inhibitor, various kinds of benzotriazol systems, a salicylate system, a benzophenone system, a cyanoacrylate system, a benzofuran derivative, a permutation acrylonitrile system, a permutation-N-phenylamino ethylene system, a pyrone system, methylene malonic ester, cinnamate, a phenyl-salicylate system, a hindered amine system, etc. are mentioned suitably. As an antioxidant, various kinds of phenol

systems, a sulfur system, a phosphoric-acid system, a naphthol system, HINDATO phenols, p phenylenediamines, hydroquinone, organosulfur compounds, organic phosphorous compounds, a HINDATO amine, a chroman system, a SUPIRO in out system, a hydrazine, etc. are mentioned suitably. These ultraviolet-rays inhibitor and the anti-oxidant may be added as an emulsion in order to raise dispersibility.

[0164]

[Embodiment of the Invention] Before it gives the pretreatment liquid of this invention to a recorded material and pretreatment liquid carries out desiccation solidification, the example of the equipment for realizing the image recording approach of this invention of drawing 1 explains the approach of accumulating which records an image with the recording ink containing color material. The example of equipment of drawing 1 is the recording device of the type which scans and carries out image formation of the head for ink jet record.

[0165] In pretreatment grant and the ink jet recording device of drawing 1, a recorded material 6 is sent out with the feed roller 7, and pretreatment liquid 1 is thinly given to a recorded material by the grant roller 4 and the counter roller 5 at homogeneity. Pretreatment liquid is pumped up with the pumping roller 3, and is given to the grant roller 4 by the thickness control roller 2 at homogeneity. A recorded material is sent to the writing scan section with the ink jet recording head 20, while pretreatment liquid is given. The form path length from the termination section (the A section in drawing) of pretreatment liquid grant actuation to the writing scan initiation section (the B section in drawing) can end grant of pretreatment liquid completely, when a recorded material reaches the writing scan initiation section, since it is set up for a long time than the die length of the feed direction of a recorded material. In this case, since grant of pretreatment liquid can be carried out before starting the scan for printing of the ink jet recording head 20 and conveying a recorded material 6 intermittently, the bearer rate of a recorded material can give it continuously in the fixed condition, and the uniform grant of it without nonuniformity is attained. In addition, in order to supply from the cassette of an upper case, the recorded material by which the required recorded material of pretreatment in the example of equipment of drawing 1 is troubled if it is processed whether there is the cassette of the lower berth to need is convenient although a recorded material conveyance path is established for a long time.

[0166] Drawing 2 is another example of the equipment for realizing the image recording approach of this invention. It is the recording device of the type with which the example of equipment of drawing 2 also scans and carries out image formation of the head for ink jet record. Compared with the equipment of drawing 1, it is the example made into the compact equipment configuration. A recorded material 6 is sent out with the feed roller 7, and pretreatment liquid 1 is thinly given to a recorded material by the grant roller 4 and the counter roller 5 at homogeneity. Pretreatment liquid is pumped up with the pumping roller 3, and is given to the grant roller 4 by the thickness control roller 2 at homogeneity. A recorded material is returned until a form head reaches a writing scan starting position again when the writing scan section with the ink jet recording head 20 was passed, it is sent until the form completed spreading of pretreatment liquid, and a form completes grant of pretreatment liquid while pretreatment liquid is given. The completion of grant is detectable by establishing a well-known recorded material detection means (not shown) near the outlet of for example, pretreatment liquid grant equipment. This detection means is good also as a system configuration which corresponds the feed per revolution of the periphery of the conveyance roller of a recorded material to the die length of a recorded material by there being not necessarily no need, inputting the information on the die length of a recorded material to a controller beforehand, and controlling the rotational frequency of a motor.

[0167] Although the recorded material with which pretreatment liquid was given is again conveyed in the writing scan location before pretreatment liquid carries out desiccation solidification, in this case, it doubles a scan and timing of the ink jet recording head 20, and is conveyed intermittently. If the same path as the path sent when returning a recorded material is returned, the back end of a form will carry out reverse close to pretreatment liquid grant equipment, it will apply, and the fault of nonuniformity, a dirt, a paper jam, etc., etc. will happen, but when returning a form, a direction is changed in the recorded material guide 31. That is, when the backward feed [a recorded material] after giving pretreatment liquid to a recorded material, the recorded material guide 31 is made to move to the location of the dotted line of drawing with well-known means, such as a solenoid and a motor. Thereby, since a recorded material is conveyed in the location of the recorded material guide 34, a recorded material can be soiled or it can prevent that a jam arises.

[0168] As for a pretreatment liquid grant process, it is desirable to carry out with a fixed linear velocity of 20 - 200 mm/s continuously. For this reason, in the example of this equipment, if it sees about the recorded material of a certain sheet using the recorded material of a sheet, after ending the process which gives pretreatment liquid to a recorded material about that sheet, the process which records an image by the ink jet record approach is begun. Thus, in equipment, since the rate of the rate of pretreatment liquid grant and image recording is not in agreement in almost all cases, a difference will be in time amount after pretreatment liquid is given until an image is recorded in the recording

start section and the record termination section of the sheet. Also when this difference becomes quite large, rather than water, the boiling point is high and contains the solvent of a hydrophilic property with a small vapor rate so much. With the pretreatment liquid currently prepared by the moisture ratio near the amount which balances the moisture in the air in the environment which is using the printer Since the moisture evaporation from liquid is controlled remarkably, the difference of the image quality produced in the recording start section and the record termination section of a recorded material of a sheet can be made below a level visually observable at least.

[0169] In order to form an image after giving pretreatment liquid so that clearly also from the conveyance process of the recorded material in this equipment, it is necessary to convey a recorded material with a means to contact recorded materials, such as a roller, koro, and a guide, in the recorded material with which pretreatment liquid was given in many cases. In such a case, if the pretreatment liquid given to the recorded material imprints to the conveyance member of a recorded material, a failure will be produced in a conveyance function, or dirt will be accumulated in it, and the problem that image quality will deteriorate will be produced. In order to prevent this problem, from an equipment side, a means to make a guide into a corrugated plate, for example, to make the koro into the shape of a spur, or to use the front face of a roller as a water-repellent ingredient can be provided, and the generating in question can be mitigated.

[0170] However, it is essentially important for the pretreatment liquid given to the recorded material to change into the condition of it having been promptly absorbed by the recorded material as much as possible, and having dried seemingly. In order to attain this purpose, it is effective to make it liquid permeate a recorded material promptly, using surface tension of pretreatment liquid as 40 or less mN/m. It means that pretreatment liquid is absorbed by the recorded material, and do not mean having come to have dried seemingly, liquefied-among pretreatment liquid compounds, such as moisture, evaporate, and it becomes impossible for "desiccation solidification" of claim 1 to keep a liquid condition above, and it solidifies it. Pretreatment liquid is absorbed by the recorded material by using the recording device with which pretreatment grant equipment and image recording equipment became a set as mentioned above about the pretreatment liquid concerning this invention, even if it is in the condition that it is dry seemingly, it is in the condition which pretreatment liquid is not solidifying, and ink-jet record can be performed and the amount of grants of pretreatment liquid can improve image quality remarkably also in a very small amount.

[0171] The example of the sequence for controlling actuation of equipment like drawing 1 and drawing 2 to drawing 3 is shown. If the print command from host machines, such as a personal computer, is received, pretreatment grant and image recording equipment start a head cleaning activity and a pretreatment liquid spreading activity to coincidence, and when preparation is completed altogether, it will start record actuation. In this case, whether it is a part for two or more scans even if it is a part for one scan, or an image data transfer is 1 page, it is not cared about. Head cleaning and injection check actuation are not necessarily required. Moreover, it is possible to process to parallel, such as not to perform sequentially head cleaning, injection check actuation, and image data processing and image data transfer, and to make coincidence start pretreatment liquid spreading, head cleaning, injection check actuation, and image data processing and image data transfer etc. Thus, also when doing a pretreatment liquid spreading activity by processing pretreatment liquid spreading, head cleaning, injection check actuation, and image data processing and image data transfer to parallel, it is possible to carry out image recording, without hardly dropping the throughput of a printing recording device.

[0172] After giving pretreatment liquid to a recorded material in the image recording approach of this invention, as a means to make adhere to a recorded material by making recording ink into a drop, and to form an image, all the well-known ink jet record approaches are applicable. Although drawing 1 and the example of equipment of drawing 2 showed the example of the ink jet record approach of the method which scans a head, in the recorded material of a certain sheet, grant and image recording of pretreatment liquid can be simultaneously performed at uniform velocity by using the Rhine-sized head.

[0173] It is desirable, and the ink-jet record approach cannot be caught by the drive method of a recording head, but can also use the head of the mold using the piezoelectric-device actuator using PZT etc., the method on which heat energy is made to act, the actuator using electrostatic force, etc. on demand, and can also record with the electric-charge control type head of a continuation injection mold especially as an approach of making it adhering to a recorded material after giving to the recorded material of the pretreatment liquid in this invention, using recording ink as a drop. In the method on which heat energy is made to act, although it is made difficult to control injection of a drop free and dispersion in the image by a recorded material kind etc. tends to become large, these technical problems are canceled by give pretreatment liquid to a recorded material, and the high definition which did not depend on a recorded material kind but was stabilized can be obtained.

[0174] Although the example and the example of a comparison of this invention are shown below, this invention is not limited to these. In addition, the amount (%) of each component given in an example is weight % especially when

unstated.

[0175] After carrying out mixed stirring by the preparation>> following recording ink formula of example 1 <<recording ink, it adjusted in the sodium hydroxide so that pH might be set to 10.5. Then, it filtered with the membrane filter of 0.1 micrometers of average apertures, and the recording ink constituent was obtained.

[0176]

[Yellow recording ink 1]

C. The I. acid yellow 23 2 % of the weight N-methyl-2-pyrrolidone 10 % of the weight Polyethylene glycol 200 15 % of the weight Diethylene-glycol monobutyl ether 12 % of the weight 1,5-pentanediol 3 % of the weight Sodium benzoate 0.4 % of the weight Ion exchange water Residue [0177]

[Magenta recording ink 1]

C. The I. acid red 52 1.5 % of the weight C.I. acid red 254 1.5 % of the weight N-methyl-2-pyrrolidone 10 % of the weight Polyethylene glycol 200 15 % of the weight Diethylene-glycol monobutyl ether 12 % of the weight 1,5-pentanediol 3 % of the weight Sodium benzoate 0.4 % of the weight Ion exchange water Residue [0178]

[Cyanogen recording ink 1]

C. The I. acid blue 9 1.5 % of the weight Projet Fast Cyan2 (product made from ABISHIA) 1.5 % of the weight N-methyl-2-pyrrolidone 10 % of the weight Polyethylene glycol 200 15 % of the weight Diethylene-glycol monobutyl ether 12 % of the weight 1,5-pentanediol 3 % of the weight Sodium benzoate 0.4 % of the weight Ion exchange water Residue [0179]

[Black recording ink 1]

C. I. hood black 2 5 % of the weight N-methyl-2-pyrrolidone 10 % of the weight Polyethylene glycol 20 15 % of the weight Diethylene-glycol monobutyl ether 12 % of the weight 1,5-pentanediol 3 % of the weight Sodium benzoate 0.4 % of the weight Ion exchange water Residue [0180] Preparation>> of <<pretreatment liquid Stirring mixing of the following constituent was carried out, and example of pretreatment liquid 1 of a recorded material was produced, and it adjusted by triethanolamine so that pH might be set to 7. The viscosity in this case was described in Table 1.

[Example of pretreatment liquid of recorded material 1]

Cationic high molecular compound given in the above-mentioned (31) term 25 % of the weight (dicyandiamide resin, weight average molecular weight 7000 [about])

Cationic monomer compound C-1 (a counter ion is a chlorine ion) 2 % of the weight Glycerol 25 % of the weight Ethylene glycol 30 % of the weight Sodium benzoate 1 % of the weight Ion exchange water When the viscosity of the pretreatment liquid of ***** was measured with B mold rotational viscometer by Tokyo Keiki Co., Ltd., it was 1270 mPa·s (25 degrees C).

[0181] <<pretreatment liquid grant and image recording evaluation>> When the pretreatment liquid container 42 of the image recording equipment which shows the above-mentioned pretreatment liquid 1 to drawing 1 was filled up and marketing carried out copy paper (NBS Ricoh: whenever [my paper < size] 39s, air permeability 46 whenever [s> and Xerox company: 4024< size] 32s, air permeability 21 s>) grant at the rate of linear-velocity 85 mm/s, it was the coating weight of 2.8 - 3.2 g/m². After giving pretreatment liquid, using yellow recording ink 1, Magenta recording ink 1, cyanogen recording ink 1, and black recording ink 1, by the print head 9 using the laminating PZT which carries out 128 nozzle ** of the nozzle of the diameter of 28 micrometer about each color head, the image was formed by the pixel consistency of 600dpi by the frequency of 20kHz, and drop weight 19ng, and observation of the following image quality and a cock ring was performed.

[0182] 1) printing of the solid image of black image concentration black recording ink -- carrying out -- the concentration of after desiccation and the solid image of black recording ink -- a reflective mold color -- a spectrum -- it measured with the colorimetry concentration meter (product made from X-Rite). O, and 1.2-1.44 took as O, and 1.45 or more took less than 1.2 for x.

[0183] 2) A Magenta, cyanogen, and the line drawing image of the line breadth of 10 dots of black were formed in the solid image of yellow at the color boundary blot recorded material, respectively, and generating of a color boundary blot was observed by viewing. Generating of a color boundary blot was observed also about the case where cyanogen, yellow, and the line drawing image of the line breadth of 10 dots of black are formed, respectively in the solid image of the case where a Magenta, yellow, and the line drawing image of the line breadth of 10 dots of black are similarly formed in the solid image of cyanogen, respectively, and a Magenta. When generating of a color boundary blot was hardly able to check visually, in a certain case, there is [generating of a color boundary blot] generating of a color boundary blot clearly by ** and viewing a little by O and viewing, and the ** case was estimated as x.

[0184] 3) A Magenta, cyanogen, yellow, and the line drawing image of the line breadth of 10 dots of black were formed on the recorded material at the feather ring record medium, respectively, and the existence of a feather ring was

observed. The case where generating could check clearly a little by ** and viewing by O and viewing in a certain case if practically satisfactory on the level which cannot be visually checked although it can check when the case where it hardly accepts even if it observes with a 10 time magnifier is observed with an O and 10 time magnifier was made into x.

[0185] When visual observation of the strike-through solid image is carried out from a rear face, the boundary of a solid image and a white part is completely indefinite and there is no trouble in reading of a double-sided printing object, 4) O, In the case of the level trouble does not almost have [level] the boundary of a solid image and a white part in reading of a double-sided printing object indefinitely, O, When the coloring agent of ** and a solid image had fallen out to the rear face when not worrisome in reading of a double-sided printing object, although the boundary of a solid image and a white part is observed, and trouble was in reading of a double-sided printing object, it considered as : and judged.

[0186] 5) Existence of the cock ring in the cock ring solid section was observed. When generating of a cock ring was hardly accepted also in a secondary color, some generating was accepted in O and a secondary color, but when the case where some cock ring is observed by O and monochrome in the case where generating is hardly accepted in one color was able to be clearly accepted also in ** and monochrome, it considered as x. The evaluation result was shown in Table 1.

[0187] It evaluated like the example 1 using the same recording ink as an example 1, and image formation equipment except not using the pretreatment liquid of example of comparison 1 recorded material. The result was shown in Table 1.

[0188] In order to compare with the image recording approach by preparation>> this invention of example of comparison 2 <<pretreatment liquid, since [with few amounts of a water-soluble organic solvent] there were many moisture contents, the compound to which the solubility of the following recording ink and dispersibility are made to fall produced the constituent (example of comparison pretreatment liquid 1) also with low viscosity like the example 1 by low concentration.

[Example of comparison pretreatment liquid 1]

A cationic high molecular compound given in the above-mentioned (31) term (dicyandiamide resin) 1.5 % of the weight Cationic monomer compound C-1 (a counter ion is a chlorine ion) 5 % of the weight Glycerol 25 % of the weight Ethylene glycol 30 % of the weight Sodium benzoate 1 % of the weight Ion exchange water When the viscosity of the pretreatment liquid of ***** was measured with B mold rotational viscometer by Tokyo Keiki Co., Ltd., it was 5.6 mPa·s (25 degrees C).

[0189] <<pretreatment liquid grant and image recording evaluation>> When the pretreatment liquid container 42 of the image recording equipment shown in drawing 1 was filled up with the above-mentioned example of comparison pretreatment liquid 1 and it was given to a commercial copy paper and bond paper at the rate of linear-velocity 85 mm/s like the example 1, it was the coating weight of 2.6 - 3.0 g/m². After giving comparison pretreatment liquid 1, the image was formed and evaluated like the example 1 using the same recording ink as what was used for the example 1. An evaluation result is shown in the example 2 of a comparison of Table 1.

[0190] In order to give the pretreatment liquid other than the head for recording a discharge image for recording ink on the equipment of drawing 1 in order to compare with the image recording approach by example of comparison 3 this invention, the head of the same configuration as what carries out the regurgitation of a supply system and the recording ink, and the driver were formed. Signal processing and a drive system are also changed and pretreatment liquid was given only to the part on which an image is recorded. The cassette which supplies liquid to the head for pretreatment liquid regurgitation of the equipment after the modification was filled up with the comparison pretreatment liquid 1 produced in the example 2 of a comparison, grant of pretreatment liquid with the roller in drawing 1 was not performed, but while the pretreatment liquid discharge head gave pretreatment liquid only to the part in which an image is formed, the same recording ink as the recording ink used in the example 1 performed image recording. When the coating weight of comparison pretreatment liquid 1 at this time was seen about the image section, it was 10.5 g/m². An evaluation result is shown in the example 3 of a comparison of Table 1.

[0191] In example of reference 1 this invention, evaluation at the time of making the amount of grants of pretreatment liquid into the former and this level was performed. In the equipment of drawing 1, by putting the same pretreatment liquid as an example 1 into the container of grant equipment, and controlling rotation of the thickness control roller 2 and a pressure with other rollers, it adjusted so that the amount of grants of pretreatment liquid might become larger than an example 1. Except that it was made for the amount of grants of pretreatment liquid to become large, the image was recorded like the example. The coating weight of comparison pretreatment liquid 1 at this time was 10.3 g/m². An evaluation result is shown in the example 1 of reference of Table 1. If the coating weight of pretreatment liquid exceed:

10 g/m², a cock ring remarkable in paper will be generated, but in performing image recording (grant of pretreatment liquid) to coincidence only at one side, it has also produced curl remarkable in the paper after image recording.

[0192] Stirring mixing of the preparation>> following constituent of the pretreatment liquid of an example 2 <<recorded material was carried out, example of pretreatment liquid 2 of a recorded material was produced, and the lithium hydroxide adjusted so that pH might be set to 7.

[Example of pretreatment liquid of recorded material 2]

Cationic high molecular compound given in the above-mentioned (33) term 15 % of the weight (counter ion chlorine ion : weight average molecular weight 3500)

The cationic monomer compound C-3 (a counter ion is a chlorine ion) 3 % of the weight Glycerol 20 % of the weight N-methyl-2-pyrrolidone 20 % of the weight 1,6-hexanediol 15 % of the weight Sodium dehydroacetate 1 % of the weight Ion exchange water When the viscosity of the pretreatment liquid of ***** was measured with B mold rotational viscometer by Tokyo Keiki Co., Ltd., it was 850 mPa·s (25 degrees C).

[0193] <<pretreatment liquid grant and image recording evaluation>> When the pretreatment liquid container 42 of the image recording equipment which shows the above-mentioned pretreatment liquid 2 to drawing 1 was filled up like the example 1 and it gave a commercial copy paper and bond paper at the rate of linear-velocity 60 mm/s, it was the coating weight of 2.6 - 3.2 g/m². After giving pretreatment liquid, it evaluated like the example 1 using the same recording ink as the recording ink used in the example 1. A result is shown in the Table 1 example 2.

[0194] In order to compare with the image recording approach by preparation>> this invention of example of comparison 4 <<pretreatment liquid, the compound to which the solubility of the following recording ink and dispersibility are made to fall was low concentration, and since [with few amounts of a water-soluble organic solvent] there were many moisture contents, viscosity as well as an example 2 was produced except having used the low constituent (example of comparison pretreatment liquid 2).

[Example of comparison pretreatment liquid 2]

Cationic high molecular compound given in the above-mentioned (33) term 3 % of the weight (counter ion chlorine ion : weight average molecular weight 3500)

Cationic monomer compound C-3 (a counter ion is a chlorine ion) 3 % of the weight Glycerol 10 % of the weight N-methyl-2-pyrrolidone 10 % of the weight 1,6-hexanediol 5% of the weight Sodium dehydroacetate 1 % of the weight Ion exchange water When the viscosity of the pretreatment liquid of ***** was measured with B mold rotational viscometer by Tokyo Keiki Co., Ltd., it was 7.9 mPa·s (25 degrees C).

[0195] <<pretreatment liquid grant and image recording evaluation>> The pretreatment liquid container 42 of the image recording equipment shown in drawing 1 like an example 2 was filled up with the above-mentioned example of comparison pretreatment liquid 2, and rotation of the thickness control roller 2 and a pressure with other rollers were adjusted so that coating weight might be set to 2.9-3.0g/m². After giving comparison pretreatment liquid 2, the image was formed and evaluated like the example 2 using the same recording ink as what was used for the example 2. An evaluation result is shown in the example 4 of a comparison of Table 1.

[0196] In order to give the pretreatment liquid other than the head for recording a discharge image for recording ink on the equipment of drawing 1 like the example 3 of example of comparison 5 comparison, the head of the same configuration as what carries out the regurgitation of a supply system and the recording ink, and the driver were formed. Signal processing and a drive system are also changed and pretreatment liquid was given only to the part on which an image is recorded. The cassette which supplies liquid to the head for pretreatment liquid regurgitation of the equipment after the modification was filled up with the comparison pretreatment liquid 2 produced in the example 4 of a comparison, grant of pretreatment liquid with the roller in drawing 1 was not performed, but while the pretreatment liquid discharge head gave pretreatment liquid only to the part in which an image is formed, the same recording ink as the recording ink used in the example 2 performed image recording. When the coating weight of comparison pretreatment liquid 2 at this time was seen about the image section, it was 10.5 g/m². An evaluation result is shown in the example 5 of a comparison of Table 1.

[0197] After carrying out mixed stirring of the dispersion-liquid constituent of each color pigment by the preparation>> following dispersion-liquid formula of example 3 <<pigment dispersion liquid, using zirconia beads with a diameter of 2mm, the bead mill performed distribution of 8 hours and pigment dispersion liquid were prepared.

[0198]

[Yellow pigment dispersion liquid 1]

C. I. pigment yellow 74 15 % of the weight Formalin condensate of a naphthalene sulfonate 3 % of the weight Diethylene glycol 15 % of the weight Ion exchange water Residue (particle-size mode after distribution 120nm)

[0199]

[Magenta pigment dispersion liquid 1]

C. I. pigment red 122 15 % of the weight Styrene-hexyl acrylate-methacrylic-acid copolymer A diethanolamine salt 5 % of the weight Ethylene glycol 13 % of the weight Ion exchange water Residue (particle-size mode 110nm after distribution)

[0200]

[Cyanogen pigment dispersion liquid 1]

C. I. pigment blue 15:3 15 % of the weight Styrene-hexyl acrylate-methacrylic-acid copolymer A diethanolamine salt 4 % of the weight Ethylene glycol 15 % of the weight Ion exchange water Residue (particle-size mode 85nm after distribution)

[0201]

[Black pigment dispersion liquid 1]

Carbon black 15 % of the weight The formalin condensate of a naphthalene sulfonate 3 % of the weight Diethylene glycol 15 % of the weight Ion exchange water Residue (particle-size mode 115nm after distribution)

[0202] Preparation>> of <<recording ink After carrying out mixed stirring of the recording ink by the following recording ink formula, 10% water solution of lithium hydroxides adjusted, and it considered as recording ink so that pH might be set to 9. Then, it filtered with the membrane filter of 1.0 micrometers of average apertures, and the recording ink constituent was obtained.

[Yellow recording ink 2]

Yellow pigment dispersion liquid 1 26.7 % of the weight (4 % of the weight of pigments)

A glycerol 10 % of the weight 2-pyrrolidone 10 % of the weight Dihexyl sulfo succinate (anionic surfactant) 1 % of the weight 2-ethyl -1, 3-hexandiol (penetrating agent) 2 % of the weight 0.2 % of the weight (antiseptics) of 2-pyridine thiol-1-oxide sodium Ion exchange water Residue [0203]

[Magenta recording ink 2]

Magenta pigment dispersion liquid 1 26.7 % of the weight (4 % of the weight of pigments)

A glycerol 10 % of the weight 2-pyrrolidone 10 % of the weight Dihexyl sulfo succinate (anionic surfactant) 1 % of the weight 2-ethyl -1, 3-hexandiol (penetrating agent) 2 % of the weight 0.2 % of the weight (antiseptics) of 2-pyridine thiol-1-oxide sodium Ion exchange water Residue [0204]

[Cyanogen recording ink 2]

Cyanogen pigment dispersion liquid 1 20 % of the weight (3 % of the weight of pigments)

A glycerol 10 % of the weight 2-pyrrolidone 10 % of the weight Dihexyl sulfo succinate (anionic surfactant) 1 % of the weight 2-ethyl -1, 3-hexandiol (penetrating agent) 2 % of the weight 0.2 % of the weight (antiseptics) of 2-pyridine thiol-1-oxide sodium Ion exchange water Residue [0205]

[Black recording ink 2]

Black pigment dispersion liquid 1 33.3 % of the weight (5 % of the weight of pigments)

A glycerol 10 % of the weight 2-pyrrolidone 10 % of the weight Dihexyl sulfo succinate (anionic surfactant) 1 % of the weight 2-ethyl -1, 3-hexandiol (penetrating agent) 2 % of the weight 0.2 % of the weight (antiseptics) of 2-pyridine thiol-1-oxide sodium Ion exchange water Residue [0206] Preparation>> of the pretreatment liquid of <<recorded material Stirring mixing of the following constituent was carried out, it adjusted by triethanolamine and example of pretreatment liquid 3 of a recorded material was produced so that pH might be set to 7.

[Example of pretreatment liquid of recorded material 3]

Cationic high molecular compound given in the above-mentioned (27) term 20 % of the weight (the carbon number of R is 1 and a counter ion is the chlorine ion: weight average molecular weight 8000)

The cationic monomer compound C-5 (a counter ion is a chlorine ion) 8 % of the weight Diethylene glycol 20 % of the weight 1, 3-dimethyl imidazolidinone 20 % of the weight Pentachlorophenol 0.5 % of the weight Ion exchange water When the viscosity of the pretreatment liquid of ***** was measured with B mold rotational viscometer by Tokyo Keiki Co., Ltd., it was 530 mPa·s (25 degrees C).

[0207] <<pretreatment liquid grant and image recording evaluation>> When the pretreatment liquid container 42 of the image recording equipment which shows example of pretreatment liquid 3 to drawing 1 was filled up and it gave a commercial copy paper and bond paper at the rate of linear-velocity 30 mm/s, it was the coating weight of 1.8 - 2.0 g/m². After giving pretreatment liquid, using yellow recording ink 2, Magenta recording ink 2, cyanogen recording ink 2, and black recording ink 2, by the print head 9 using the laminating PZT which carries out 128 nozzle ** of the nozzle of the diameter of 22 micrometer about each color head, image formation was carried out by the pixel consistency of 1200dpi by the frequency of 25kHz, and drop weight 10ng, and evaluation of image quality and a cock ring was performed like the example 1. The result was shown in the example 3 of Table 1.

[0208] It evaluated like the example 1 using the same recording ink as an example 3, and image formation equipment except not using the pretreatment liquid of example of comparison 6 recorded material. The result was shown in Table 1.

[0209] In order to compare with the image recording approach by preparation>> this invention of example of comparison 7 <<comparison pretreatment liquid, it produced like the example 1 except the compound to which the solubility of the following recording ink and dispersibility are made to fall using a low-concentration constituent (example of comparison pretreatment liquid 3).

[Example of comparison pretreatment liquid 3]

Cationic high molecular compound given in the above-mentioned (27) term 5 % of the weight (the carbon number of R is 1 and a counter ion is the chlorine ion: weight average molecular weight 1500)

The cationic monomer compound C-5 (a counter ion is a chlorine ion) 8 % of the weight Diethylene glycol 10 % of the weight 1, 3-dimethyl imidazolidinone 10 % of the weight Pentachlorophenol 0.5 % of the weight Ion exchange water

When the viscosity of the pretreatment liquid of ***** was measured with B mold rotational viscometer by Tokyo Keiki Co., Ltd., it was 4.8 mPa·s (25 degrees C).

[0210] <<pretreatment liquid grant and image recording evaluation>> In the equipment which changed the equipment of drawing 1 which prepared the head for carrying out the regurgitation of the pretreatment liquid in the example 3 of a comparison, recording ink was changed according to the head for carrying out the regurgitation of the head for giving pretreatment liquid, and the drop weight of pretreatment liquid gave pretreatment liquid so that 10ng and a regurgitation consistency might serve as 1200dpi. And like the example 3 of a comparison, grant of pretreatment liquid with the roller in drawing 1 was not performed, but while the pretreatment liquid discharge head gave pretreatment liquid only to the part in which an image is formed, the same recording ink as the recording ink used in the example 3 performed image recording in the pixel consistency of 1200dpi. When the coating weight of comparison pretreatment liquid 3 at this time was seen about the image section, it was 5.2 g/m². An evaluation result is shown in the example 7 of a comparison of Table 1.

[0211] although pretreatment liquid was given only to the part in which an image is formed in the example 7 of example of comparison 8 comparison -- a recorded material -- it crossed to the front face mostly and evaluated by performing image recording like the example 7 of a comparison the regurgitation [pretreatment liquid] and except having changed driver software so that it might be given. The result did not have the case where pretreatment liquid is given only to the image section, and a change.

[0212] Although the recording head for pretreatment liquid regurgitation which used example of pretreatment liquid 3 produced in the example of comparison 9 example 3 in the example 3 of a comparison and the example 7 of a comparison was filled up and the regurgitation of pretreatment liquid was tried, liquid was not able to carry out the regurgitation at all.

[0213] Stirring mixing of the example 4 following constituent was carried out, it adjusted by triethanolamine and example of pretreatment liquid 4 of a recorded material was produced so that pH might be set to 7, and grant to the recorded material of pretreatment liquid and image formation were performed like the example 3 except transposing example of pretreatment liquid 3 in an example 3 to example of pretreatment liquid 4.

[Example of pretreatment liquid of recorded material 4]

Cationic high molecular compound given in the above-mentioned (36) term 20 % of the weight (R6 is a methyl group and a counter ion is the nitrate ion: weight average molecular weight 6000)

The cationic monomer compound C-1 (a counter ion is acetic-acid ion) 8 % of the weight Diethylene glycol 15 % of the weight Glycerol 15 % of the weight N-methyl-2-pyrrolidone 15 % of the weight Pentachlorophenol 0.5 % of the weight Ion exchange water Residue Viscosity: 250 mPa·s (25 degrees C)

[0214] Stirring mixing of the example 5 following constituent was carried out, 10% water solution of sodium hydroxides adjusted, example of pretreatment liquid 5 of a recorded material was produced so that pH might be set to 6 and grant to the recorded material of pretreatment liquid and image formation were performed like the example 3 except transposing example of pretreatment liquid 3 in an example 3 to example of pretreatment liquid 5.

[Example of pretreatment liquid of recorded material 5]

Cationic high molecular compound given in the above-mentioned (35) term 32 % of the weight (for a methylene group and X, hydroxyl and Y are [R5] -OCOCH3)

The cationic monomer compound C-1 (a counter ion is acetic-acid ion) 3 % of the weight Ethylene glycol 15 % of the weight Glycerol 15 % of the weight 1,5-pentanediol 15 % of the weight Sorbic acid 0.8 % of the weight Ion exchange water Residue Viscosity: 710 mPa·s (25 degrees C)

[0215] Stirring mixing of the example 6 following constituent was carried out, 10% water solution of

tetramethylammonium hydroxide adjusted, example of pretreatment liquid 6 of a recorded material was produced so that pH might be set to 7, and grant to the recorded material of pretreatment liquid and image formation were performed like the example 3 except transposing example of pretreatment liquid 3 in an example 3 to example of pretreatment liquid 6.

[Example of pretreatment liquid of recorded material 6]

Cationic high molecular compound given in the above-mentioned (30) term 30 % of the weight (a counter ion is acetic-acid ion and weight average molecular weight 9000)

Polyoxyethylene nonylphenyl ether (nonionic surface active agent)

3 % of the weight 1,6-hexanediol 30 % of the weight Diethylene glycol 15 % of the weight Sorbic acid 0.8 % of the weight Ion exchange water Residue Viscosity: 1430 mPa-s (25 degrees C)

[0216] After carrying out mixed stirring of the recording ink by the preparation>> following recording ink formula of example 7 <<recording ink, 10% water solution of lithium hydroxides adjusted, and it considered as recording ink so that pH might be set to 9. Then, 0.1 micrometers of average apertures and black recording ink filtered with the membrane filter of 0.8 micrometers of average apertures, and color recording ink obtained the recording ink constituent.

[0217]

[Yellow recording ink 3]

C. The I. acid yellow 23 1 % of the weight C.I. direct yellow 86 1 % of the weight Glycerol 5 % of the weight 1,5-pentanediol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate 1 % of the weight (anionic surface active agent)

Sodium dehydroacetate 0.4 % of the weight Ion exchange water Residue [0218]

[Magenta recording ink 3]

C. The I. reactive red 180 2 % of the weight C.I. acid red 52 1 % of the weight Glycerol 5 % of the weight 1,5-pentanediol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate 1 % of the weight (anionic surface active agent) sodium dehydroacetate 0.4 % of the weight Ion exchange water Residue [0219]

[Cyanogen recording ink 3]

C. The I. acid blue 249 2 % of the weight C.I. reactive blue 7 1 % of the weight Glycerol 5 % of the weight 1,5-pentanediol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate 1 % of the weight (anionic surface active agent)

Sodium dehydroacetate 0.4 % of the weight Ion exchange water Residue [0220]

[Black recording ink 3]

Anionic microencapsulation carbon black 5 % of the weight (Dainippon Ink make) Mean particle diameter of 125nm Glycerol 5 % of the weight 1,5-pentanediol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate 1 % of the weight (anionic surface active agent)

Sodium dehydroacetate 0.4 % of the weight Ion exchange water Residue [0221] Preparation>> of <<pretreatment liquid Stirring mixing of the following constituent was carried out, and example of pretreatment liquid 7 of a recorded material was produced, and it adjusted by triethanolamine so that pH might be set to 7.

[Example of pretreatment liquid of recorded material 7]

Cationic high molecular compound given in the above-mentioned (39) term 18 % of the weight (counter ion acetic-acid ion : weight average molecular weight 15000)

The cationic monomer compound C-1 (a counter ion is a chlorine ion) 4 % of the weight Glycerol 15 % of the weight 1,5-pentanediol 15 % of the weight 2-pyrrolidone 10 % of the weight Sodium benzoate 1 % of the weight Ion exchange water When the viscosity of the pretreatment liquid of ***** was measured with B mold rotational viscometer by Tokyo Keiki Co., Ltd., it was 640 mPa-s (25 degrees C).

[0222] <<pretreatment liquid grant and image recording evaluation>> When the pretreatment liquid container 42 of the image recording equipment which shows the above-mentioned pretreatment liquid 7 to drawing 1 was filled up and marketing carried out copy paper (NBS Ricoh: my paper, Xerox company:4024) grant at the rate of linear-velocity 105 mm/s, it was the coating weight of 4.8 - 4.9 g/m². After giving pretreatment liquid, the print head 9 using the laminating PZT which carries out 128 nozzle ** of the nozzle of the diameter of 28 micrometer about each color head performed observation of the following image quality and a cock ring for image formation by the pixel consistency of 600dpi at the frequency of 20kHz, and drop weight 19ng using yellow recording ink 3, Magenta recording ink 3, cyanogen recording ink 3, and black recording ink 3.

[0223] It evaluated like the example 7 using the same recording ink as an example 7, and image formation equipment except not using the pretreatment liquid of example of comparison 11 recorded material.

[0224] After carrying out mixed stirring of the recording ink by the preparation>> following recording ink formula of example 8 <<recording ink, 10% water solution of sodium hydroxides adjusted, and it considered as recording ink so that pH might be set to 9. Then, 0.1 micrometers of average apertures and black recording ink filtered with the membrane filter of 0.8 micrometers of average apertures, and color recording ink obtained the recording ink constituent.

[0225]

[Yellow recording ink 4]

C. The I. acid yellow 23 1 % of the weight C.I. direct yellow 142 1 % of the weight Tetraethylene glycol 8 % of the weight Diethylene glycol 15 % of the weight Polyoxyethylene tridecyl ether phosphoric acid Na (anionic surface active agent)

1 % of the weight 2-ethyl -1, 3-hexandiol 2 % of the weight 2-pyridine thio-roux 1-oxide sodium (preservation-from-decay antifungal agent)

0.1 % of the weight Ion exchange water Residue [0226]

[Magenta recording ink 4]

C. I. acid red 254 2 % of the weight Tetraethylene glycol 8 % of the weight Diethylene glycol 15 % of the weight Polyoxyethylene tridecyl ether phosphoric acid Na (anionic surface active agent)

1 % of the weight 2-ethyl -1, 3-hexandiol 2 % of the weight 2-pyridine thio-roux 1-oxide sodium (preservation-from-decay antifungal agent)

0.1 % of the weight Ion exchange water Residue [0227]

[Cyanogen recording ink 4]

C. The I. acid blue 249 2 % of the weight C.I. direct blue 199 1 % of the weight Tetraethylene glycol 8 % of the weight Diethylene glycol 15 % of the weight Polyoxyethylene tridecyl ether phosphoric acid Na (anionic surface active agent)

1 % of the weight 2-ethyl -1, 3-hexandiol 2 % of the weight 2-pyridine thio-roux 1-oxide sodium (preservation-from-decay antifungal agent)

0.1 % of the weight Ion exchange water Residue [0228]

[Black recording ink 4]

Sulfone radical installation self-distributed carbon black dispersion liquid (Cabot Corp. make)

15 % of the weight Tetraethylene glycol 8 % of the weight Diethylene glycol 15 % of the weight Polyoxyethylene tridecyl ether phosphoric acid Na (anionic surface active agent)

1 % of the weight 2-ethyl -1, 3-hexandiol 2 % of the weight 2-pyridine thio-roux 1-oxide sodium (preservation-from-decay antifungal agent)

0.1 % of the weight Ion exchange water Residue [0229] Preparation>> of <<pretreatment liquid Stirring mixing of the following constituent was carried out, and example of pretreatment liquid 8 of a recorded material was produced, and it adjusted by diethanolamine so that pH might be set to 7.

[Example of pretreatment liquid of recorded material 8]

Cationic high molecular compound given in the above-mentioned (28) term 32 % of the weight (weight average molecular weight 4000)

The cationic monomer compound C-4 (a counter ion is a chlorine ion) 2 % of the weight Diethylene glycol 26 % of the weight 2-pyrrolidone 8 % of the weight Benzoic-acid potassium 1 % of the weight Ion exchange water When the viscosity of the pretreatment liquid of ***** was measured with B mold rotational viscometer by Tokyo Keiki Co., Ltd., it was 1850 mPa·s (25 degrees C).

[0230] When the pretreatment liquid container 42 of the image recording equipment which shows the above-mentioned pretreatment liquid 8 to drawing 1 was filled up and marketing carried out copy paper (NBS Ricoh: my paper, Xerox company:4024) grant at the rate of linear-velocity 60 mm/s, it was the coating weight of 1.8 g/m². After giving pretreatment liquid, the print head 9 using the laminating PZT which carries out 128 nozzle ** of the nozzle of the diameter of 28 micrometer about each color head performed observation of the following image quality and a cock ring for image formation by the pixel consistency of 600dpi at the frequency of 20kHz, and drop weight 19ng using yellow recording ink 4, Magenta recording ink 4, cyanogen recording ink 4, and black recording ink 4.

[0231] It evaluated like the example 8 using the same recording ink as an example 8, and image formation equipment except not using the pretreatment liquid of example of comparison 12 recorded material. The result was shown in Table 1.

[0232] In example of comparison 13 example 8, the recorded material which gave pretreatment liquid in the amount of 1.8 g/m² is taken out before forming an image, and it is put into 110-degree C oven for 5 minutes, and moisture and a water-soluble organic solvent were removed. After 2-hour leaving this recorded material under ordinary temperature

normal relative humidity; it evaluated like the example 8 using the same recording ink as an example 8. The result was shown in Table 1.

[0233] In the example 13 of example of comparison 14 comparison, the coating weight of pretreatment liquid was adjusted to 5.3 g/m² by controlling rotation of the thickness control roller 2 and a pressure with other rollers. Except that it was made for the coating weight of pretreatment liquid to become large, the image was recorded like the example 13 of a comparison. The result was shown in Table 1.

[0234] Stirring mixing of the example 9 following constituent was carried out, 10% water solution of sodium hydroxides adjusted, example of pretreatment liquid 9 of a recorded material was produced so that pH might be set to 7.5, and grant to the recorded material of pretreatment liquid and image formation were performed like the example 8 except transposing example of pretreatment liquid 8 in an example 8 to example of pretreatment liquid 9. The result was shown in Table 1.

[Example of pretreatment liquid of recorded material 9]

Cationic high molecular compound given in the above-mentioned (29) term 26 % of the weight (for a methyl group and R4, an ethyl group and X are [R1, R2, and R3] nitrate ion)

The cationic monomer compound C-3 (a counter ion is acetic-acid ion) 3 % of the weight 1, 6-pentanediol 23 % of the weight 2-ethyl -1, 3-hexandiol 3 % of the weight Triethylene glycol 13 % of the weight Sorbic acid 0.8 % of the weight Ion exchange water Residue Viscosity: 1360 mPa-s (25 degrees C)

[0235] Stirring mixing of the example 10 following constituent was carried out, the hydroxylation tetraethylammonium 10% water solution adjusted, example of pretreatment liquid 10 of a recorded material was produced so that pH might be set to 7.5, and grant to the recorded material of pretreatment liquid and image formation were performed like the example 8 except transposing example of pretreatment liquid 8 in an example 8 to example of pretreatment liquid 10. The result was shown in Table 1.

[Example of pretreatment liquid of recorded material 10]

Cationic high molecular compound given in the above-mentioned (38) term 12 % of the weight (a counter ion is nitrate ion and weight average molecular weight 16000)

Polyoxyethylene oleyl ether (nonionic surface active agent) 3 % of the weight 1,6-hexanediol 27 % of the weight Ethylene glycol 19 % of the weight Benzoic-acid potassium 0.8 % of the weight Ion exchange water Residue Viscosity 86 mPa-s (25 degrees C)

[0236] After carrying out mixed stirring of the dispersion-liquid constituent of each color pigment by the preparation>> following dispersion-liquid formula of example 11 <<pigment dispersion liquid, using zirconia beads with a diameter of 2mm, the bead mill performed distribution of 8 hours and pigment dispersion liquid were prepared.

[0237]

[Yellow pigment dispersion liquid 2]

C. I. pigment yellow 150 15 % of the weight Styrene-acrylic-acid Na copolymer 5 % of the weight Ethylene glycol 15 % of the weight Ion exchange water Residue (particle-size mode after distribution 70nm)

[0238]

[Magenta pigment dispersion liquid 2]

C. I. pigment red 81 15 % of the weight Styrene-hexyl acrylate-acrylic-acid Na copolymer 5 % of the weight Ethylene glycol 15 % of the weight Ion exchange water Residue (particle-size mode 96nm after distribution)

[0239]

[Cyanogen pigment dispersion liquid 2]

C. I. pigment blue 15:2 15 % of the weight Styrene-hexyl acrylate-methacrylic-acid copolymer Diethanolamine salt 5.6 % of the weight Ethylene glycol 15 % of the weight Ion exchange water Residue (particle-size mode 83nm after distribution)

[0240]

[Black pigment dispersion liquid 2]

Carbon black 15 % of the weight Styrene-hexyl acrylate-methacrylic-acid copolymer A diethanolamine salt 4 % of the weight Ethylene glycol 15 % of the weight Ion exchange water Residue (particle-size mode 96nm after distribution)

[0241] Preparation>> of <<recording ink After carrying out mixed stirring by the following recording ink formula, 10% water solution of lithium hydroxides adjusted, and it considered as recording ink so that pH might be set to 9. Then, it filtered with the membrane filter of 1.0 micrometers of average apertures, and the recording ink constituent was obtained.

[0242]

[Yellow recording ink 5]

Yellow pigment dispersion liquid 2 20 % of the weight (3 % of the weight of pigments)

A diethylene glycol 10 % of the weight N-methyl-2-pyrrolidone 10 % of the weight Polyoxyethylene nonyl ether (Nonion nature surface active agent) 3 % of the weight 0.2 % of the weight (antiseptics) of 2-pyridine thiol-1-oxide sodium Ion exchange water Residue [0243]

[Magenta recording ink 5]

Magenta pigment dispersion liquid 2 26.7 % of the weight (4 % of the weight of pigments)

A diethylene glycol 10 % of the weight N-methyl-2-pyrrolidone 10 % of the weight Polyoxyethylene nonyl ether (Nonion nature surface active agent) 3 % of the weight 0.2 % of the weight (antiseptics) of 2-pyridine thiol-1-oxide sodium Ion exchange water Residue [0244]

[Cyanogen recording ink 5]

Cyanogen pigment dispersion liquid 2 26.7 % of the weight (4 % of the weight of pigments)

A diethylene glycol 10 % of the weight N-methyl-2-pyrrolidone 10 % of the weight Polyoxyethylene nonyl ether (Nonion nature surface active agent) 3 % of the weight 0.2 % of the weight (antiseptics) of 2-pyridine thiol-1-oxide sodium Ion exchange water Residue [0245]

[Black recording ink 5]

Black pigment dispersion liquid 2 26.7 % of the weight (4 % of the weight of pigments)

A diethylene glycol 10 % of the weight N-methyl-2-pyrrolidone 10 % of the weight Polyoxyethylene nonyl ether (Nonion nature surface active agent) 3 % of the weight 0.2 % of the weight (antiseptics) of 2-pyridine thiol-1-oxide sodium Ion exchange water Residue [0246] Preparation>> of the pretreatment liquid of <<recorded material Stirring mixing of the following constituent was carried out, it adjusted by triethanolamine and example of pretreatment liquid 11 of a recorded material was produced so that pH might be set to 7.

[Example of pretreatment liquid of recorded material 11]

Cationic high molecular compound given in the above-mentioned (43) term 15 % of the weight (counter ion chlorine ion : weight average molecular weight 6000)

Akrit UW319-SX 41 % of the weight (cationic emulsion)

Polyoxyethylene nonyl ether (Nonion nature surfactant) 4 % of the weight Glycerol 20 % of the weight 1, 3-dimethyl imidazolidinone When the viscosity of this pretreatment liquid was measured with B mold rotational viscometer by Tokyo Keiki Co., Ltd. 20% of the weight, it was 120 mPa-s (25 degrees C).

[0247] <<pretreatment liquid grant and image recording evaluation>> When the pretreatment liquid container 42 of the image recording equipment which shows example of pretreatment liquid 11 to drawing 1 was filled up and it gave a commercial copy paper and bond paper at the rate of linear-velocity 45 mm/s, it was the coating weight of 2.5 - 2.8 g/m². After giving pretreatment liquid, using yellow recording ink 5, Magenta recording ink 5, cyanogen recording ink 5, and black recording ink 5, by the print head 9 using the laminating PZT which carries out 128 nozzle ** of the nozzle of the diameter of 22 micrometer about each color head, image formation was carried out by the pixel consistency of 1200dpi by the frequency of 25kHz, and drop weight 10ng, and evaluation of image quality and a cock ring was performed like the example 1. The result was shown in the example 11 of Table 1.

[0248] It evaluated like the example 1 using the same recording ink as an example 11, and image formation equipment except not using the pretreatment liquid of example of comparison 15 recorded material. The result was shown in Table 1.

[0249] In order to compare with the image recording approach by preparation>> this invention of example of comparison 16 <<comparison pretreatment liquid, it produced like the example 11 except the compound to which the solubility of the following recording ink and dispersibility are made to fall using a low-concentration constituent (example of comparison pretreatment liquid 4).

[Example of comparison pretreatment liquid 4]

Cationic high molecular compound given in the above-mentioned (43) term 3 % of the weight (a counter ion is a chlorine ion and weight average molecular weight 6000)

Akrit UW319-SX 4 % of the weight (cationic emulsion)

Polyoxyethylene nonyl ether (Nonion nature surfactant) 4 % of the weight Glycerol 10 % of the weight 1, 3-dimethyl imidazolidinone 10 % of the weight Ion exchange water When the viscosity of the pretreatment liquid of ***** was measured with B mold rotational viscometer by Tokyo Keiki Co., Ltd., it was 7.6 mPa-s (25 degrees C).

[0250] <<pretreatment liquid grant and image recording evaluation>> Grant and image formation of pretreatment liquid were performed like the example 11 except having used example of comparison pretreatment liquid 4. The result was shown in Table 1.

[0251] the equipment of drawing 1 which prepared the head in order to carry out the regurgitation of the pretreatment

liquid used in the example 5 of a comparison using example of comparison pretreatment liquid 4 produced in the example 16 of example of comparison 17 comparison, and added modification, and the example 5 of a comparison -- the same -- grant of pretreatment liquid -- image formation was carried out and it evaluated. The result was shown in Table 1.

[0252] Stirring mixing of the example 12 following constituent was carried out, 10% water solution of sodium hydroxides adjusted, example of pretreatment liquid 12 of a recorded material was produced so that pH might be set to 7.0, and grant to the recorded material of pretreatment liquid and image formation were performed like the example 11 except transposing example of pretreatment liquid 11 in an example 11 to example of pretreatment liquid 12. The result was shown in Table 1.

[Example of pretreatment liquid of recorded material 12]

Example of a cationic high molecular compound given in the above-mentioned (41) term 16 % of the weight (a counter ion is nitrate ion)

CEP10AK97006 (cation silica by the Cabot SUPESHARUTI KEMIKARUZU ink company)

45 % of the weight Polyoxyethylene alkyl acetic-acid lithium (anion system surfactant)

1 % of the weight Glycerol 15 % of the weight 1, 6-pentanediol 10 % of the weight Triethylene glycol 10 % of the weight 2-ethyl -1, 3-hexandiol 3 % of the weight Viscosity: 320 mPa-s (25 degrees C)

[0253] Stirring mixing of the example 13 following constituent was carried out, 10% water solution of lithium hydroxides adjusted, example of pretreatment liquid 13 of a recorded material was produced so that pH might be set to 7.0, and grant to the recorded material of pretreatment liquid and image formation were performed like the example 11 except transposing example of pretreatment liquid 11 in an example 11 to example of pretreatment liquid 13. The result was shown in Table 1.

[Example of pretreatment liquid of recorded material 13]

Cationic high molecular compound given in the above-mentioned (37) term 12 % of the weight (a counter ion is R7 and a chlorine ion and R8 are a methyl group and weight average molecular weight 9600)

Akrit RKW-450SX 50 % of the weight (TAISEI chemically-modified company styrene acrylic cationic emulsion)

Polyoxyethylene oleyl ether (nonionic surface active agent) 2 % of the weight Triethylene glycol 19 % of the weight 2-pyrrolidone 11 % of the weight 1,6-hexanediol 5 % of the weight Benzoic-acid potassium 1 % of the weight Viscosity: 75 mPa-s (25 degrees C)

[0254] Stirring mixing of the example 14 following constituent was carried out, 10% water solution of lithium hydroxides adjusted, example of pretreatment liquid 14 of a recorded material was produced so that pH might be set to 7.0, and grant to the recorded material of pretreatment liquid and image formation were performed like the example 11 except transposing example of pretreatment liquid 11 in an example 11 to example of pretreatment liquid 14. The result was shown in Table 1.

[Example of pretreatment liquid of recorded material 14]

Cationic high molecular compound given in the above-mentioned (27) term 12 % of the weight (R is a methylene group and a counter ion is a chlorine ion and weight average molecular weight 12000)

Snow tex AK (cation silica by Nissan chemistry incorporated company) 50 % of the weight Ethyleneoxide-propylene oxide block polymer 5 % of the weight (Nonion system surfactant)

A polyethylene glycol 200 15 % of the weight 2-pyrrolidone 10 % of the weight 1,6-hexanediol 6 % of the weight Benzoic-acid potassium 2 % of the weight Viscosity: 260 mPa-s (25 degrees C)

[0255] Stirring mixing of the example 15 following constituent was carried out, 10% water solution of sodium hydroxides adjusted, example of pretreatment liquid 15 of a recorded material was produced so that pH might be set to 6.5, and grant to the recorded material of pretreatment liquid and image formation were performed like the example 11 except transposing example of pretreatment liquid 11 in an example 11 to example of pretreatment liquid 15. The result was shown in Table 1.

[Example of pretreatment liquid of recorded material 15]

Cationic high molecular compound given in the above-mentioned (40) term 46 % of the weight (j=k=2: weight average molecular weight 5000)

The cationic monomer compound C-2 (a counter ion is a chlorine ion) 8 % of the weight Glycerol 20 % of the weight 1,5-pentanediol 20 % of the weight SOFUTA Norian 70 (NIPPON SHOKUBAI nonionic surface active agent) 1 % of the weight Pentachlorophenol sodium 0.1 % of the weight Ion exchange water Residue Viscosity: 860 mPa-s (25 degrees C)

[0256] Stirring mixing of the example 16 following constituent was carried out, 10% water solution of sodium hydroxides adjusted, example of pretreatment liquid 16 of a recorded material was produced so that pH might be set to

6.5, and grant to the recorded material of pretreatment liquid and image formation were performed like the example 11 except transposing example of pretreatment liquid 11 in an example 11 to example of pretreatment liquid 16. The result was shown in Table 1.

[Example of pretreatment liquid of recorded material 16]

Compound of the example 5 of a cationic high molecular compound 27 % of the weight (weight average molecular weight 4000)

The cationic monomer compound C-2 (a counter ion is a chlorine ion) 8 % of the weight Glycerol 20 % of the weight 1,5-pentanediol 20 % of the weight Pentachlorophenol sodium 0.1 % of the weight Ion exchange water Residue Viscosity: 760 mPa·s (25 degrees C)

[0257] It evaluated by performing grant and image formation of pretreatment liquid like the example 11 using example of pretreatment liquid 16 of each recording ink given in example 17 - example 25 example 11, and a recorded material given in an example 16 except having changed the recorded material. The result was shown in Table 1.

Example 17: Xerox Corp. make; Xerox paper R (whenever [size] 8s, 20s of air permeability)

Example 18: AUSTRALIAN The product made from PAPER (Australia); REFLEX (whenever [size] 25s, 4s of air permeability)

Example 19: NBS Ricoh Co., Ltd. make; NBS facsimile-posting form 90K (whenever [size] 60s, 68s of air permeability)

Example 20: Canon company make ;P B form (whenever [size] 21s, 8s of air permeability)

Example 21: NBS Ricoh Co., Ltd. make; NBS facsimile-posting form 45K (whenever [size] 11s, 45s of air permeability)

Example 22: by Honshu Paper Co., Ltd., and ***** (whenever [size] 12s, 21s of air permeability)

Example 23: Ricoh Co., Ltd. make; **** PPC form type S (whenever [size] 22s, 13s of air permeability)

Example 24: Xerox Corp. make ;P Paper (whenever [size] 24s, 19s of air permeability)

Example 25: Xerox Corp. make; multi-ace (whenever [size] 25s, 17s of air permeability)

[0258] It compared by performing image formation like the example 16 - the example 25 except not giving pretreatment liquid in each case of example 18 of comparison - example of comparison 28 example 16 - an example 25 The result was shown in Table 1.

; by Example of Comparison 18:NBS Ricoh Co., Ltd. -- my paper ; by example of pretreatment-liquid-grant-less comparison 19:Xerox Corp. -- 4024 ; by example of pretreatment-liquid-grant-less comparison 20:Xerox Corp.

Xerox paper R with no pretreatment liquid grant -- example of comparison 21:AUSTRALIAN ; made from PAPER (Australia)

REFLEX Example of pretreatment-liquid-grant-less comparison 22:NBS Ricoh Co., Ltd. make; NBS facsimile-posting form 90K The example 23 of a pretreatment liquid grant-less comparison: Canon company make ;P B form Example of pretreatment-liquid-grant-less comparison 24:NBS Ricoh Co., Ltd. make; NBS facsimile-posting form 45 The example 25 of a pretreatment-liquid-grant-less comparison : [; by Honshu Paper Co., Ltd., and *****] Example of pretreatment-liquid-grant-less comparison 26:Ricoh Co., Ltd. make; The **** PPC form type S example of - pretreatment-liquid-grant-less comparison 27:Xerox Corp. make ;P Paper ; by example of pretreatment-liquid-grant-less comparison 28:Xerox Corp. -- the multi-ace [with no **** with pretreatment -- 0259]

[Table 1]

表1-1

	被覆材の前 処理熟度	前處理剤付 与方式	被覆材の 前處理熟度	1)面濃度 にじみ	2)色彩界 リング	3)フェイ リング	4)斑跡	5)カシグ
実施例1	1270	ローラ	2.8~3.2	◎	○	○	○	○
比較例1	—	—	0	×	×	×	×	○
比較例2	5.6	ローラ	2.6~3.0	△	△	△	△	○
比較例3	5.6	I J	10.5	○	○	△	△	×
参考例1	1270	ローラ	10.3	◎	◎	○	◎	×
実施例2	850	ローラ	2.6~3.2	○	◎	○	○	○
比較例4	—	—	0	×	×	×	×	○
比較例4	7.9	ローラ	2.9~3.0	△	△	△	△	○
比較例5	7.9	I J	10.5	○	△	○	△	×
実施例3	530	ローラ	1.8~2.0	◎	◎	◎	◎	◎
比較例6	—	—	0	×	△	△	△	◎
比較例7	4.8	I J	5.2	△	○	△	△	△
比較例8	4.8	I J	5.2	△	○	△	△	△
比較例9	530	I J	0	吐出不能				
実施例4	250	ローラ	1.5~1.8	◎	◎	○	○	◎
実施例5	710	ローラ	1.8~2.0	◎	◎	◎	◎	◎
実施例6	1430	ローラ	2.0~2.5	○	○	○	◎	◎
比較例10	—	—	0	×	△	△	△	◎
実施例7	640	ローラ	4.8~4.9	◎	○	○	○	○
比較例11	—	—	0	×	△	×	×	○
実施例8	1850	ローラ	1.8	◎	○	○	○	○
比較例12	—	—	0	×	×	×	×	○
比較例13	1850	ローラ	1.8 (乾燥有)	△	△	×	×	○
比較例14	1850	ローラ	5.3 (乾燥有)	△	△	×	△	○

[Table 2]

表1-2

	被記録材の前 処理濃度	前処理剤の 与方式	被記録材の 前処理剤着量	1)画像濃度	2)色境界 にじみ	3)フェザ リング	4)裏面カ ラム	5)カッタケ
実施例 9	1360	ローラ	6.5	◎	○	○	◎	△
実施例 10	88	ローラ	9.3	○	◎	○	○	△
実施例 11	120	ローラ	2.5~2.8	○	○	○	○	○
比較例 15	—	—	0	×	△	×	△	○
比較例 16	7.6	ローラ	2.8~2.9	×	△	×	△	○
比較例 17	7.6	I J	10.3	△	△	△	△	×
実施例 12	320	ローラ	5.6	○	○	○	○	△
実施例 13	75	ローラ	3.6~3.9	○	◎	○	○	○
実施例 14	260	ローラ	3.8~4.0	○	○	○	◎	○
実施例 15	860	ローラ	1.9~2.2	◎	◎	○	○	○
実施例 16	760	ローラ	2.9	◎	◎	○	◎	○
実施例 17	760	ローラ	3.0	◎	◎	○	◎	○
実施例 18	760	ローラ	3.1	◎	◎	○	◎	○
実施例 19	760	ローラ	2.9	◎	◎	○	◎	○
実施例 20	760	ローラ	2.8	◎	◎	○	◎	○
実施例 21	760	ローラ	2.9	◎	◎	○	○	○
実施例 22	760	ローラ	3.2	◎	◎	○	◎	○
実施例 23	760	ローラ	2.9	◎	○	○	◎	○
実施例 24	760	ローラ	2.7	◎	◎	○	◎	○
実施例 25	760	ローラ	2.9	◎	◎	○	◎	○

[Table 3]

表1-3

	被記録材の前 処理濃度	前処理剤の 与方式	被記録材の 前処理剤着量	1)画像濃度	2)色境界 にじみ	3)フェザ リング	4)裏面カ ラム	5)カッタケ
比較例 18	—	—	0	×	△	×	△	○
比較例 19	—	—	0	×	×	×	△	○
比較例 20	—	—	0	×	×	△	△	○
比較例 21	—	—	0	×	△	×	△	○
比較例 22	—	—	0	×	△	△	△	○
比較例 23	—	—	0	×	△	×	△	○
比較例 24	—	—	0	△	△	×	△	○
比較例 25	—	—	0	×	×	×	△	○
比較例 26	—	—	0	×	△	×	△	○
比較例 27	—	—	0	×	△	×	△	○
比較例 28	—	—	0	×	×	×	△	○

[0260] In order to prepare an example 26 recording-ink constituent, after carrying out mixed stirring of the ingredient by the following recording ink formula, 10% water solution of lithium hydroxides adjusted so that pH might be set to 10.5. Then, it filtered with the membrane filter of 0.1 micrometers of average apertures, and the recording ink constituent was obtained.

[Yellow recording ink 6]

C. The I. acid yellow 23 1 % of the weight Projet Fast Yellow2 (product made from ABISHA) 1 % of the weight Glycerol 5 % of the weight Ethylene glycol 20 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate

(anionic surface active agent) 1 % of the weight 2, 2, 4-TORIME methyl -1, 3-pentanediol 1 % of the weight Sodium benzoate 0.4 % of the weight Ion exchange water Residue [0261]

[Magenta recording ink 6]

C. The I. acid red 52 1 % of the weight Projet Fast Magenta2 (product made from ABISHA) 1 % of the weight Glycerol 5 % of the weight Ethylene glycol 20 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (anionic surface active agent) 1 % of the weight 2, 2, 4-TORIME methyl -1, 3-pentanediol 1 % of the weight Sodium benzoate 0.4-% of the weight ion exchange water Residue [0262]

[Cyanogen recording ink 6]

C. The I. acid blue 9 1 % of the weight Projet Fast Cyan2 (product made from ABISHA) 1 % of the weight Glycerol 5 % of the weight Ethylene glycol 20 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (Anionic surface active agent) 1 % of the weight 2, 2, 4-TORIME methyl -1, 3-pentanediol 1 % of the weight Sodium benzoate 0.4 % of the weight Ion exchange water Residue [0263]

[Black recording ink 6]

C. The I. direct black 168 3 % of the weight Glycerol 5 % of the weight Ethylene glycol 20 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (Anionic surface active agent) 1 % of the weight 2, 2, 4-TORIME methyl -1, 3-pentanediol 1 % of the weight Sodium benzoate 0.4 % of the weight Ion exchange water Residue [0264] Moreover, stirring mixing of the following constituent was carried out, and the pretreatment liquid 17 of a recorded material was produced, and it adjusted by triethanolamine so that pH might be set to 7. The viscosity in this case was described in Table 4.

[Pretreatment liquid 17 of a recorded material]

The polyethyleneimine induction cationic resin which contains the above-mentioned general formula (1) as a structural unit (weight average molecular weight 5000) 8 % of the weight Glycerol 40 % of the weight Ethylene glycol 40 % of the weight (Mitsuhiro -- formation -- the shrine 4th class ammonium mold) Io -- network D46 1 % of the weight of cationic surface active agents Sodium benzoate 1 % of the weight Ion exchange water Residue [0265] In order to prepare an example 27 recording-ink constituent, after carrying out mixed stirring of the ingredient by the following recording ink formula, 10% water solution of lithium hydroxides adjusted, and it considered as recording ink so that pH might be set to 9. Then, it filtered with the membrane filter of 0.8 micrometers of average apertures, and the recording ink constituent was obtained.

[Yellow recording ink 7]

Yellow pigment dispersion liquid 1 33.3 % of the weight (5 % of the weight of pigments)
A glycerol 5 % of the weight Diethylene glycol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (Anionic surface active agent) 1 % of the weight 2-ethyl -1, 3-hexandiol 2 % of the weight SAMPAKKU AP (San-Ai Oil antifungal agent) 0.4 % of the weight Ion exchange water Residue Notes: Yellow pigment dispersion liquid 1 C.I. pigment yellow 74 (mean particle diameter of 96nm) 15 % of the weight Formalin condensate of a naphthalene sulfonate 3 % of the weight Ion exchange water Residue [0266]

[Magenta recording ink 7]

Magenta pigment dispersion liquid 3 33.3 % of the weight (5 % of the weight of pigments)
A glycerol 5 % of the weight Diethylene glycol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (Anionic surface active agent) 1 % of the weight 2-ethyl -1, 3-hexandiol 2 % of the weight SAMPAKKU AP (San-Ai Oil antifungal agent) 0.4 % of the weight Ion exchange water Residue Notes: Magenta pigment dispersion-liquid 3C.I. pigment red 122 (120nm of mean diameters) 15 % of the weight Styrene-acrylate-methacrylic-acid diethanolamine salt copolymer 3 % of the weight Ion exchange water Residue [0267]

[Cyanogen recording ink 7]

Cyanogen pigment dispersion liquid 3 33.3 % of the weight (5 % of the weight of pigments)
A glycerol 5 % of the weight Diethylene glycol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (Anionic surface active agent) 1 % of the weight 2-ethyl -1, 3-hexandiol 2 % of the weight SAMPAKKU AP (San-Ai Oil antifungal agent) 0.4 % of the weight Ion exchange water Residue Notes: Cyanogen pigment dispersion-liquid 3 C.I. pigment blue 15:3 (123nm of mean diameters) 15-% of the weight styrene-acrylate-methacrylic-acid diethanolamine salt copolymer 3 % of the weight Ion exchange water Residue [0268]

[Black recording ink 7]

Black pigment dispersion liquid 3 33.3 % of the weight (5 % of the weight of pigments)

A glycerol 5 % of the weight Diethylene glycol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (Anionic surface active agent) 1 % of the weight 2-ethyl -1, 3-hexandiol 2 % of the weight SAMPAKKU AP (San-Ai Oil antifungal agent) 0.4 % of the weight Ion exchange water Residue Notes: Black pigment dispersion-liquid 3 carbon

black Mean particle diameter of 99nm 15 % of the weight Formalin condensate of a naphthalene sulfonate 3 % of the weight Ion exchange water Residue [0269] Moreover, stirring mixing of the following constituent was carried out, and the pretreatment liquid of a recorded material was produced, and it adjusted by triethanolamine so that pH might be set to 7. The viscosity in this case was described in Table 4.

[Pretreatment liquid 18 of a recorded material]

The polyethyleneimine induction cationic resin which contains the above-mentioned general formula (1) as a structural unit (weight average molecular weight 5000) 70 % of the weight Glycerol 10 % of the weight 1,5-pentanediol 10 % of the weight SOFUTA Norian 70 (NIPPON SHOKUBAI nonionic surface active agent) 1 % of the weight Pentachlorophenol sodium 0.1 % of the weight Ion exchange water Residue [0270] In order to prepare an example 28 recording-ink constituent, after carrying out mixed stirring of the ingredient by the following recording ink formula, 10% water solution of lithium hydroxides adjusted, and it considered as recording ink so that pH might be set to 9. Then, 0.1 micrometers of average apertures and black recording ink filtered with the membrane filter of 0.8 micrometers of average apertures, and color recording ink obtained the recording ink constituent.

[0271]

[Yellow recording ink 8]

C. The I. acid yellow 23 1 % of the weight C.I. direct yellow 142 1 % of the weight N-methyl-2-pyrrolidone 7 % of the weight Diethylene glycol 15 % of the weight Dialkyl sulfo succinate 1 % of the weight 2-ethyl -1, 3-hexandiol 1 % of the weight 0.4 % of the weight of pentachlorophenol sodium Ion exchange water Residue [0272]

[Magenta recording ink 8]

C. The I. acid red 254 2 % of the weight N-methyl-2-pyrrolidone 7 % of the weight Diethylene glycol 15 % of the weight Dialkyl sulfo succinate 1 % of the weight 2-ethyl -1, 3-hexandiol 1 % of the weight Pentachlorophenol sodium 0.4 % of the weight Ion exchange water Residue [0273]

[Cyanogen recording ink 8]

C. The I. acid blue 249 2 % of the weight C.I. direct blue 199 1 % of the weight N-methyl-2-pyrrolidone 7 % of the weight Diethylene glycol 15 % of the weight Dialkyl sulfo succinate 1 % of the weight 2-ethyl -1, 3-hexandiol 1 % of the weight Pentachlorophenol sodium 0.4 % of the weight Ion exchange water Residue [0274]

[Black recording ink 8]

Black pigment dispersion liquid 4 33.3 % of the weight (5 % of the weight of pigments)

A N-methyl-2-pyrrolidone 7 % of the weight Diethylene glycol 15 % of the weight Dialkyl sulfo succinate 1 % of the weight 2-ethyl -1, 3-hexandiol 1 % of the weight Pentachlorophenol sodium 0.4 % of the weight Ion exchange water Residue Notes: Black pigment dispersion-liquid 4 carbon black Mean particle diameter of 99nm 15 % of the weight Styrene-acrylate-methacrylic-acid diethanolamine salt copolymer 3 % of the weight Ion exchange water Residue

[0275] Moreover, stirring mixing of the following constituent was carried out, and the pretreatment liquid of a recorded material was produced, and it adjusted by triethanolamine so that pH might be set to 7. The viscosity in this case was described in Table 4.

[Pretreatment liquid 19 of a recorded material]

The polyethyleneimine induction cationic resin which contains the above-mentioned general formula (1) as a structural unit (weight average molecular weight 15000) 20 % of the weight Glycerol 50 % of the weight 1,6-hexanediol 1.5 % of the weight SOFUTA Norian 120 (NIPPON SHOKUBAI nonionic surface active agent) 1 % of the weight 2-pyridine thiol-1-oxide sodium 5 % of the weight Ion exchange water Residue [0276] In order to prepare an example 29 recording-ink constituent, after carrying out mixed stirring of the ingredient by the following recording ink formula, 10% water solution of lithium hydroxides adjusted, and it considered as recording ink so that pH might be set to 9. Then, 0.1 micrometers of average apertures and black recording ink filtered with the membrane filter of 0.8 micrometers of average apertures, and color recording ink obtained the recording ink constituent.

[0277]

[Yellow recording ink 9]

C. The I. acid yellow 23 1 % of the weight C.I. direct yellow 86 1 % of the weight Glycerol 5 % of the weight Triethylene glycol 15 % of the weight SOFUTA Norian 120 (NIPPON SHOKUBAI nonionic surface active agent) 1 % of the weight Diethylene-glycol monobutyl ether 3 % of the weight 2-pyridine thiol-1-oxide sodium 0.4 % of the weight Ion exchange water Residue [0278]

[Magenta recording ink 9]

C. The I. reactive red 180 2 % of the weight C.I. acid red 52 1 % of the weight Glycerol 5 % of the weight Triethylene glycol 15 % of the weight SOFUTA Norian 120 (NIPPON SHOKUBAI nonionic surface active agent) 1 % of the weight Diethylene-glycol monobutyl ether 3 % of the weight 2-pyridine thiol-1-oxide sodium 0.4 % of the weight Ion

exchange water Residue [0279]

[Cyanogen recording ink 9]

C. The I. acid blue 249 2 % of the weight C.I. reactive blue 7 1 % of the weight Glycerol 5 % of the weight Triethylene glycol 15 % of the weight SOFUTA Norian 120 (NIPPON SHOKUBAI nonionic surface active agent) 1 % of the weight Diethylene-glycol monobutyl ether 3 % of the weight 2-pyridine thiol-1-oxide sodium 0.4 % of the weight Ion exchange water Residue [0280]

[Black recording ink 9]

Anion system surface-active-agent distributed carbon black (**** coloring matter company make)

The mean particle diameter of 110nm 5 % of the weight Glycerol 5 % of the weight Diethylene glycol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (Anionic surface active agent) 1 % of the weight 2-ethyl -1, 3-hexandiol 2 % of the weight 2-pyridine thiol-1-oxide sodium 0.4 % of the weight Ion exchange water Residue [0281] Moreover, stirring mixing of the following constituent was carried out, and the pretreatment liquid of a recorded material was produced, and it adjusted by triethanolamine so that pH might be set to 7. The viscosity in this case was described in Table 4.

[Pretreatment liquid 20 of a recorded material]

The polyethyleneimine induction cationic resin which contains the above-mentioned general formula (2) as a structural unit (weight average molecular weight 15000) 30 % of the weight Glycerol 25 % of the weight Diethylene glycol 25 % of the weight 2-pyrrolidone 10 % of the weight (the Asahi electrification company make) ADEKA Pluronic L31 [ethyleneoxide-] Propylene oxide system nonionic surface active agent 1 % of the weight Sodium sorbate 1 % of the weight Ion exchange water Residue [0282] In order to prepare an example 30 recording-ink constituent, after carrying out mixed stirring of the ingredient by the following recording ink formula, 10% water solution of lithium hydroxides adjusted, and it considered as recording ink so that pH might be set to 9. Then, 0.1 micrometers of average apertures and black recording ink filtered with the membrane filter of 0.8 micrometers of average apertures, and color recording ink obtained the recording ink constituent.

[0283]

[Yellow recording ink 10]

C. The I. acid yellow 23 1 % of the weight Projet Fast Yellow2 (product made from ABISHA) 1% of the weight Glycerol 5 % of the weight Diethylene glycol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (anionic surface active agent) 2 % of the weight Sodium sorbate 0.4 % of the weight Ion exchange water Residue [0284]

[Magenta recording ink 10]

C. The I. acid red 52 1 % of the weight Projet Fast Magenta2 (product made from ABISHA) 1 % of the weight Glycerol 5 % of the weight Diethylene glycol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (anionic surface active agent) 2 % of the weight Sodium sorbate 0.4 % of the weight Ion exchange water Residue [0285]

[Cyanogen recording ink 10]

C. The I. acid blue 9 1 % of the weight Projet Fast Cyan2 (product made from ABISHA) 1 % of the weight Glycerol 5 % of the weight Diethylene glycol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (anionic surface active agent) 2 % of the weight Sodium sorbate 0.4 % of the weight Ion exchange water Residue [0286]

[Black recording ink 10]

Sulfonic group joint mold carbon black dispersion liquid The mean particle diameter of 122nm 5 % of the weight Glycerol 5 % of the weight Diethylene glycol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (anionic surface active agent) 2 % of the weight Sodium sorbate 0.4 % of the weight Ion exchange water Residue [0287] Moreover, stirring mixing of the following constituent was carried out, and the pretreatment liquid of a recorded material was produced, and it adjusted by triethanolamine so that pH might be set to 7. The viscosity in this case was described in Table 4.

[Pretreatment liquid 21 of a recorded material]

The polyethyleneimine induction cationic resin which contains the above-mentioned general formula (2) as a structural unit (weight average molecular weight 15000) 50 % of the weight Glycerol 20% of the weight Triethylene glycol 10 % of the weight 2-pyrrolidone 10 % of the weight Sodium dehydroacetate 0.4 % of the weight Ion exchange water Residue [0288] In order to prepare an example 31 recording-ink constituent, after carrying out mixed stirring of the ingredient by the following recording ink formula, 10% water solution of lithium hydroxides adjusted, and it considered as recording ink so that pH might be set to 9. Then, 0.1 micrometers of average apertures and black recording ink filtered with the membrane filter of 0.8 micrometers of average apertures, and color recording ink

obtained the recording ink constituent.

[0289]

[Yellow recording ink 11]

C. The I. acid yellow 23 1 % of the weight C.I. direct yellow 142 1 % of the weight Glycerol 5 % of the weight Diethylene glycol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (Anionic surface active agent) 1 % of the weight 2-ethyl -1, 3-hexandiol 1 % of the weight SAMPAKKU AP (San-Ai Oil antifungal agent) 0.4-% of the weight ion exchange water Residue [0290]

[Magenta recording ink 11]

C. The I. acid red 254 2 % of the weight Glycerol 5 % of the weight Diethylene glycol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (Anionic surface active agent) 1 % of the weight 2-ethyl -1, 1 % of the weight of 3-hexandiol SAMPAKKU AP (San-Ai Oil antifungal agent) 0.4 % of the weight Ion exchange water Residue [0291]

[Cyanogen recording ink 11]

C. The I. acid blue 249 2 % of the weight C.I. direct blue 199 1 % of the weight Glycerol 5 % of the weight Diethylene glycol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (anionic surface active agent) 1 % of the weight 2-ethyl -1, 3-hexandiol 1 % of the weight SAMPAKKU AP (San-Ai Oil antifungal agent) 0.4 % of the weight Ion exchange water Residue [0292]

[Black recording ink 11]

Carboxyl group joint mold carbon black dispersion liquid The mean particle diameter of 128nm 5 % of the weight Glycerol 5 % of the weight Diethylene glycol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (Anionic surface active agent) 1 % of the weight 2-ethyl -1, 3-hexandiol 2 % of the weight SAMPAKKU AP (San-Ai Oil antifungal agent) 0.4 % of the weight Ion exchange water Residue [0293] Moreover, stirring mixing of the following constituent was carried out, and the pretreatment liquid of a recorded material was produced, and it adjusted by triethanolamine so that pH might be set to 7. The viscosity in this case was described in Table 4.

[Pretreatment liquid 22 of a recorded material]

The polyethyleneimine induction cationic resin which contains the above-mentioned general formula (2) as a structural unit (weight average molecular weight 10000) 30 % of the weight Glycerol 10 % of the weight SAMPAKKU AP (San-Ai Oil antifungal agent) 0.4 % of the weight Cation G-50 (Mitsuhiro formation shrine alkyl dimethylbenzyl ammonium chloride cationic surface active agent) 1 % of the weight Ion exchange water Residue [0294] In order to prepare an example 32 recording-ink constituent, after carrying out mixed stirring of the ingredient by the following recording ink formula, 10% water solution of lithium hydroxides adjusted, and it considered as recording ink so that pH might be set to 9. Then, 0.1 micrometers of average apertures and black recording ink filtered with the membrane filter of 0.8 micrometers of average apertures, and color recording ink obtained the recording ink constituent.

[0295]

[Yellow recording ink 12]

C. The I. acid yellow 23 1 % of the weight C.I. direct yellow 86 1 % of the weight Glycerol 10 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (anionic surface active agent) 1 % of the weight 2-ethyl -1, 3-hexandiol 1 % of the weight 2-pyrrolidone 2 % of the weight SAMPAKKU AP (San-Ai Oil antifungal agent) 0.4 % of the weight Ion exchange water Residue [0296]

[Magenta recording ink 12]

C. The I. reactive red 180 2 % of the weight C.I. acid red 52 1 % of the weight Glycerol 10 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (Anionic surface active agent) 1 % of the weight 2-ethyl -1, 3-hexandiol 1 % of the weight 2-pyrrolidone 2 % of the weight SAMPAKKU AP (San-Ai Oil antifungal agent) 0.4 % of the weight Ion exchange water Residue [0297]

[Cyanogen recording ink 12]

C. The I. acid blue 249 2 % of the weight C.I. reactive blue 7 1 % of the weight Glycerol 10 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (anionic surface active agent) 1 % of the weight 2-ethyl -1, 3-hexandiol 1 % of the weight 2-pyrrolidone 2 % of the weight SAMPAKKU AP (San-Ai Oil antifungal agent) 0.4 % of the weight Ion exchange water Residue [0298]

[Black recording ink 12]

Giant-molecule dispersant distributed carbon black (great Nissei-ized company make)

The mean particle diameter of 118nm 5 % of the weight Glycerol 10 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (Anionic surface active agent) 1 % of the weight 2-ethyl -1, 3-hexandiol 1 % of the weight 2-pyrrolidone 2 % of the weight SAMPAKKU AP (San-Ai Oil antifungal agent) 0.4 % of the weight Ion exchange water

Residue [0299] Moreover, stirring mixing of the following constituent was carried out, and the pretreatment liquid of a recorded material was produced, and it adjusted by triethanolamine so that pH might be set to 7. The viscosity in this case was described in Table 4.

[Pretreatment liquid 23 of a recorded material]

The polyethyleneimine induction cationic resin which contains the above-mentioned general formula (2) as a structural unit (weight average molecular weight 10000) 50 % of the weight Glycerol 5 % of the weight Diethylene glycol 15 % of the weight Cation G-50(Mitsuhiro formation shrine alkyl dimethylbenzyl ammonium chloride cationic surface active agent) 1 % of the weight Sodium dehydroacetate 0.4 % of the weight 2-pyrrolidone Residue [0300] After carrying out mixed stirring by the example 33 following recording ink formula, 10% water solution of lithium hydroxides adjusted, and it considered as recording ink so that pH might be set to 9. Then, for 0.1 micrometers of average apertures, and black recording ink, color recording ink is [0301] which filtered with the membrane filter of 0.8 micrometers of average apertures, and obtained the recording ink constituent.

[Yellow recording ink 13]

C. The I. acid yellow 23 1 % of the weight C.I. direct yellow 86 1 % of the weight Glycerol 5 % of the weight 1,5-pentanediol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (anionic surface active agent) 1 % of the weight Sodium dehydroacetate 0.4 % of the weight Ion exchange water Residue [0302]

[Magenta recording ink 13]

C. The I. reactive red 180 2 % of the weight C.I. acid red 52 1 % of the weight Glycerol 5 % of the weight 1,5-pentanediol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (anionic surface active agent) 1 % of the weight Sodium dehydroacetate 0.4 % of the weight Ion exchange water Residue [0303]

[Cyanogen recording ink 13] C.I. acid blue 249 2 % of the weight C.I. reactive blue 7 1 % of the weight Glycerol 5 % of the weight 1,5-pentanediol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (anionic surface active agent) 1 % of the weight Sodium dehydroacetate 0.4 % of the weight Ion exchange water Residue [0304]

[Black recording ink 13]

Anionic microencapsulation carbon black (Dainippon Ink make)

The mean particle diameter of 125nm 5 % of the weight Glycerol 5 % of the weight 1,5-pentanediol 15 % of the weight Polyoxyethylene (3) tridecyl ether sodium acetate (anionic surface active agent) 1 % of the weight Sodium dehydroacetate 0.4 % of the weight Ion exchange water Residue [0305] Moreover, stirring mixing of the following constituent was carried out, and the pretreatment liquid of a recorded material was produced, and it adjusted by triethanolamine so that pH might be set to 7. The viscosity in this case was described in Table 4.

[Pretreatment liquid 24 of a recorded material]

The polyethyleneimine induction cationic resin which contains the above-mentioned general formula (2) as a structural unit (weight average molecular weight 30000) 20 % of the weight Glycerol 10 % of the weight SAMPAKKU AP (San-Ai Oil antifungal agent) the 0.4 % of the weight cation G-50 (Mitsuhiro -- formation -- shrine alkyl dimethylbenzyl ammonium) chloride cationic surface active agent 2 % of the weight Ion exchange water Residue [0306] The ink jet printer which has the following recording head which filled up the above-mentioned recording ink with the coating weight which used the equipment of drawing 1 and indicated the pretreatment liquid of a recorded material to Table 4 below about the recording ink of the 26 to example 33 above-mentioned publication and the pretreatment liquid of a recorded material after giving a my paper (NBS Ricoh Co., Ltd. make) performed ****. The used recording head is equipped with the head which used the PZT piezoelectric device as a driving source, and the heater to which film boiling of the recording ink is carried out, and is three kinds of the head using this as a driving source, and the head using electrostatic force as a driving source. The **** image using each recording head was synthetically evaluated for every following item, and the obtained result was described in Table 4.

[0307] 1) printing of the solid image of image concentration black recording ink -- carrying out -- the concentration of after desiccation and the solid image of black recording ink -- a reflective mold color -- a spectrum -- it measured with the colorimetry concentration meter (product made from X-Rite). O, and 1.2-1.44 took as O, and 1.45 or more took less than 1.2 for x.

[0308] 2) When a Magenta, cyanogen, and the 0.5mm line drawing image of black were formed in the solid image of yellow, respectively and the recording ink of a different color adjoined a color boundary blot record medium, generating of a color boundary blot spread and started was observed by viewing. Generating of a color boundary blot was observed also about the case where cyanogen, yellow, and the 0.5mm line drawing image of black are formed, respectively in the solid image of the case where a Magenta, yellow, and the 0.5mm line drawing image of black are similarly formed in the solid image of cyanogen, respectively, and a Magenta. Generating of a color boundary blot can hardly check visually, but if practically satisfactory at all, in the case of the level from which generating of a color

boundary blot may pose a problem depending on operating conditions, such as a **** and a small alphabetic character, a little by O and viewing, there is generating of a color boundary blot by ** and viewing, and in the case of the level from which anticipated use also poses a problem, it was made into x.

[0309] 3) Form a Magenta, cyanogen, yellow, and the 0.5mm line drawing image of black in a feather ring record medium, respectively. Although it can check when the case where it is hardly accepted even if generating of the blot by the form where wood fiber called a feather ring was met observes with a magnifier 10 times is observed with O and a 10 time magnifier With the level which cannot be checked visually, when practically satisfactory, it could check by O and viewing, and in the case of the level which poses a problem, it was made into x.

[0310] 4) Printing of color tone red, Green, blue, yellow, a Magenta, and a cyanogen color was performed, and the color tone was visually judged to ten persons after desiccation, and when it was the color tone which will apply O and the case of being permissible to O and clearness if it is a clear color tone, it considered as x.

[0311] 5) a strike-through record medium -- a reflective mold color -- a spectrum -- the solid image was formed so that the concentration in each record liquid color measured with the colorimetry densimeter (product made from X-Rite) might be set to 1.0. Carried out visual observation from the rear face, and the coloring agent of a solid image has escaped from this image to the rear face. In the case of the level which cannot be used for double-sided printing, the coloring agent of x and a solid image has not fallen out up to the rear face, but When the boundary of a solid image and a white part uses it for double-sided printing by ** and others and it is inconvenient, **, In the case of the level which is convenient even if the boundary of a solid image and a white part uses almost for double-sided printing indefinitely, even if the boundary of O, a solid image, and a white part was completely indefinite and used it for double-sided printing, when convenient, it judged as O.

[0312] 6) In the case of the level to which a problem is given to O and a quality of printed character in the case of the level which does not give a problem to a quality of printed character, it was made into x, although there was generating of O and a some when the solid image of curl and cock ring black recording ink was printed and generating of curl and a cock ring was hardly accepted.

[0313] 7) After the solid image formed in the waterproof record medium with each color recording ink is immersed in 30-degree C ion exchange water for 60 seconds, push a filter paper by the pressure of 0.1 kg/cm. When a coloring agent did not imprint in a filter paper and a blot of an image did not have it, either, O and a coloring agent imprinted in the filter paper a little, but when there was nothing, O and a coloring agent imprinted the blot of an image in the filter paper, and when it had also generated the blot of an image, it was taken as x.

[0314] Next, about the pretreatment liquid of the recorded material of the 26 to example 33 above-mentioned publication, it set in the equipment of drawing 1 and the following trial was performed.

[0315] 8) Setting the pretreatment liquid of the shelf-life recorded material of the pretreatment liquid of a recorded material in the equipment of drawing 1, it was left for 60 degrees C and 30 days, and when it could be used satisfactory after that and there were O and a problem, it considered as x.

[0316] except for not using the pretreatment liquid of example of comparison 29 recorded material -- an example 26 -- the same -- carrying out -- 1- 5 and 7 were examined.

[0317] except for not using the pretreatment liquid of example of comparison 30 recorded material -- an example 27 -- the same -- carrying out -- 1- 5 and 7 were examined.

[0318] except for not using the pretreatment liquid of example of comparison 31 recorded material -- an example 28 -- the same -- carrying out -- 1- 5 and 7 were examined.

[0319] except for not using the pretreatment liquid of example of comparison 32 recorded material -- an example 29 -- the same -- carrying out -- 1- 5 and 7 were examined.

[0320] except for not using the pretreatment liquid of example of comparison 33 recorded material -- an example 30 -- the same -- carrying out -- 1- 5 and 7 were examined.

[0321] except for not using the pretreatment liquid of example of comparison 34 recorded material -- an example 31 -- the same -- carrying out -- 1- 5 and 7 were examined.

[0322] except for not using the pretreatment liquid of example of comparison 35 recorded material -- an example 32 -- the same -- carrying out -- 1- 5 and 7 were examined.

[0323] except for not using the pretreatment liquid of example of comparison 36 recorded material -- an example 33 -- the same -- carrying out -- 1- 5 and 7 were examined.

[0324] After filling up the recording head using the PZT piezoelectric device as a driving source with the pretreatment liquid 22 of the recorded material used in the example of comparison 37 example 31 and injecting it to a recorded material, the same recording head which prepared the recording ink of each color of an example 31 apart from pretreatment liquid was filled up, respectively, it injected to the recorded material, and 1-8 were examined. The

pretreatment liquid of a recorded material was injected into the part of the recorded material with which the recording ink of each color is injected. However, the regurgitation of the recording head filled up with pretreatment liquid was not carried out.

[0325] Instead of the pretreatment liquid 22 of the recorded material used in the example 37 of example of comparison 38 comparison, 1-8 were examined like the example 37 of a comparison except having used the pretreatment liquid 25 of a recorded material. The viscosity of this liquid was described in Table 4.

[Pretreatment liquid 25 of a recorded material]

Cationic resin (weight average molecular weight 10000) 2 % of the weight Glycerol 10 % of the weight SAMPAKKU AP (San-Ai Oil antifungal agent) the 0.4 % of the weight cation G-50 (Mitsuhiro -- formation -- shrine alkyl dimethylbenzyl ammonium) Chloride Cationic surface active agent 1 % of the weight Ion exchange water The regurgitation of the recording head filled up with pretreatment liquid was not carried out like the example 37 of a residue comparison.

[0326] Instead of the pretreatment liquid 25 of the recorded material used in the example 37 of example of comparison 39 comparison, 1-8 were examined like the example 37 of a comparison except having used the pretreatment liquid 26 of a recorded material. The viscosity of this liquid was described in Table 4.

[Pretreatment liquid 26 of a recorded material]

Cationic resin (weight average molecular weight 10000) 1 % of the weight Glycerol 10 % of the weight SAMPAKKU AP (San-Ai Oil antifungal agent) the 0.4 % of the weight cation G-50 (Mitsuhiro -- formation -- shrine alkyl dimethylbenzyl ammonium) Chloride Cationic surface active agent 1 % of the weight Ion exchange water Residue

[0327] Example 34 - example 43 example Above-mentioned 1-above-mentioned 7 were examined to the following record medium using each recording ink of a publication, and the pretreatment liquid of a recorded material. The test result was described in Table 4.

Example 34: Xerox Corp. make; Xerox paper R (whenever [size] 8s, 20s of air permeability)

Example 35: AUSTRALIAN The product made from PAPER (Australia); REFLEX (whenever [size] 25s, 4s of air permeability)

Example 36: NBS Ricoh Co., Ltd. make; NBS facsimile-posting form 90K (S whenever [size] 60 air permeability 68 S)

Example 37: Canon company make ;P B form (S whenever [size] 21 air permeability 8 S)

Example 38: NBS Ricoh Co., Ltd. make; NBS facsimile-posting form 45K (S whenever [size] 11 air permeability 45 S)

Example 39: ; by Honshu Paper Co., Ltd., and ***** (S whenever [size] 12 air permeability 21 S)

Example 40: Ricoh Co., Ltd. make; **** PPC form type S (S whenever [size] 22 air permeability 13 S)

Example 41: Xerox Corp. make ;P Paper (S whenever [size] 24 air permeability 19 S)

Example 42: Xerox Corp. make; multi-ace (S whenever [size] 25 air permeability 17 S)

Example 43: Xerox Corp. make; Xerox 4024 paper (S whenever [size] 32 air permeability 21 S)

[Table 4]

図4

	被記録材の 前処理液 粘度	被記録材の 前処理液 付着量	1) 高濃度 混度	2) 色境界 にじみ	3) パラフィン グ	4) 色調	5) 深抜け	6) カラム	7) 耐水性	8) 前処理液 保存性
実施例 26	900	9	○	○	○	○	○	○	○	○
実施例 27	100	8	◎	◎	◎	○	○	○	◎	○
実施例 28	600	6	◎	◎	◎	◎	◎	○	◎	○
実施例 29	400	4	◎	◎	◎	◎	◎	◎	○	○
実施例 30	200	9	◎	◎	◎	◎	◎	◎	◎	○
実施例 31	—	8	◎	◎	◎	◎	◎	○	◎	○
実施例 32	—	8	◎	◎	◎	◎	◎	◎	◎	○
実施例 33	—	40	◎	◎	◎	◎	○	○	◎	○
比較例 29	—	—	×	×	×	○	×	—	×	—
比較例 30	—	—	○	△	○	×	△	—	○	—
比較例 31	—	—	○	△	×	○	△	—	×	—
比較例 32	—	—	○	△	×	○	×	—	×	—
比較例 33	—	—	○	△	×	○	×	—	×	—
比較例 34	—	—	○	△	×	○	×	—	×	—
比較例 35	—	—	○	△	×	○	×	—	×	—
比較例 36	—	—	○	△	×	○	×	—	×	—
比較例 37	900	被記録材の 前処理液 不吐出	—	—	—	—	—	—	—	—
比較例 38	10	被記録材の 前処理液 不吐出	—	—	—	—	—	—	—	—
比較例 39	5	16	○	△	×	○	×	×	○	○
実施例 34	80	4	◎	◎	◎	◎	◎	○	◎	○
実施例 35	80	4	◎	◎	◎	◎	◎	○	◎	○
実施例 36	80	4	◎	◎	◎	◎	◎	○	◎	○
実施例 37	80	4	◎	◎	◎	◎	◎	○	◎	○
実施例 38	80	4	◎	◎	◎	◎	◎	○	◎	○
実施例 39	80	4	◎	◎	◎	◎	◎	○	◎	○
実施例 40	80	4	◎	◎	◎	◎	◎	○	◎	○
実施例 41	80	4	◎	◎	◎	◎	◎	○	◎	○
実施例 42	80	4	◎	◎	◎	◎	◎	○	◎	○
実施例 43	80	4	◎	◎	◎	◎	◎	○	◎	○

[0328] Each recording ink of yellow, a Magenta, cyanogen, and black was adjusted like example 44 example 26. Moreover, stirring mixing of the following constituent was carried out, and the pretreatment liquid of a recorded material was produced, and it adjusted by triethanolamine so that pH might be set to 7. The viscosity in this case was described in Table 5.

[Pretreatment liquid 27 of a recorded material]

Cello pole YM-500 (dicyandiamide resin by Sanyo Chemical Industries, Ltd.)

8 % of the weight Glycerol 40 % of the weight Ethylene glycol 40 % of the weight The surfactant of the above-mentioned general formula (6) 1 % of the weight Sodium benzoate (antifungal agent) 1 % of the weight Ion exchange water Residue [0329] Each recording ink of yellow, a Magenta, cyanogen, and black was adjusted like example 45 example 27. Moreover, stirring mixing of the following constituent was carried out, and the pretreatment liquid of a recorded material was produced, and it adjusted by triethanolamine so that pH might be set to 7. The viscosity in this case was described in Table 5.

[Pretreatment liquid 28 of a recorded material]

Cello pole YM-600 (dicyandiamide resin by Sanyo Chemical Industries, Ltd.)

70 % of the weight Glycerol 10 % of the weight 1,5-pentanediol 10 % of the weight The surfactant of the above-mentioned general formula (6) 1 % of the weight Pentachlorophenol sodium (antifungal agent) 0.1 % of the weight Ion exchange water Residue [0330] Each recording ink of yellow, a Magenta, cyanogen, and black was adjusted like example 46 example 28. Moreover, stirring mixing of the following constituent was carried out, and the pretreatment liquid of a recorded material was produced, and it adjusted by triethanolamine so that pH might be set to 7. The viscosity in this case was described in Table 5.

[Pretreatment liquid 29 of a recorded material]

SANFIKKUSU 70 (dicyandiamide resin by Sanyo Chemical Industries, Ltd.)

20 % of the weight Glycerol 50 % of the weight 1,6-hexanediol 1.5 % of the weight The surfactant of the above-mentioned general formula (6) 1 % of the weight 2-pyridine thiol-1-oxide sodium (antifungal agent) 5 % of the weight Ion exchange water Residue [0331] Each recording ink of yellow, a Magenta, cyanogen, and black was adjusted like example 47 example 29. Moreover, stirring mixing of the following constituent was carried out, and the pretreatment liquid of a recorded material was produced, and it adjusted by triethanolamine so that pH might be set to 7. The viscosity in this case was described in Table 5.

[Pretreatment liquid 30 of a recorded material]

Q105-H (Hymo Corp. dicyandiamide resin) 30 % of the weight Glycerol 25 % of the weight Diethylene glycol 25 % of the weight 2-pyrrolidone 10 % of the weight Surface active agent of the above-mentioned general formula (7) 1 % of the weight Sodium sorbate (antifungal agent) 1 % of the weight Ion exchange water Residue [0332] Each recording ink

of yellow, a Magenta, cyanogen, and black was adjusted like example 48 example 30. Moreover, stirring mixing of the following constituent was carried out, and the pretreatment liquid of a recorded material was produced, and it adjusted by triethanolamine so that pH might be set to 7. The viscosity in this case was described in Table 5.

[Pretreatment liquid 31 of a recorded material]

Cello pole YM-500 (dicyandiamide resin by Sanyo Chemical Industries, Ltd.)

50 % of the weight Glycerol 20 % of the weight Triethylene glycol 10 % of the weight 2-pyrrolidone 10 % of the weight The surfactant of the above-mentioned general formula (8) 1 % of the weight Sodium dehydroacetate (antifungal agent) 0.4 % of the weight Ion exchange water Residue [0333] Each recording ink of yellow, a Magenta, cyanogen, and black was adjusted like example 49 example 31. Moreover, stirring mixing of the following constituent was carried out, and the pretreatment liquid of a recorded material was produced, and it adjusted by triethanolamine so that pH might be set to 7. The viscosity in this case was described in Table 5.

[Pretreatment liquid 32 of a recorded material]

Cello pole YM-600 (dicyandiamide resin by Sanyo Chemical Industries, Ltd.)

30 % of the weight Glycerol 10 % of the weight SAMPAKKU AP (San-Ai Oil antifungal agent) 0.4 % of the weight Surfactant of the above-mentioned general formula (9) 1 % of the weight Ion exchange water Residue [0334] Each recording ink of yellow, a Magenta, cyanogen, and black was adjusted like example 50 example 32. Moreover, stirring mixing of the following constituent was carried out, and the pretreatment liquid of a recorded material was produced, and it adjusted by triethanolamine so that pH might be set to 7. The viscosity in this case was described in Table 5.

[Pretreatment liquid 33 of a recorded material]

SANFIKKUSU 70 (dicyandiamide resin by Sanyo Chemical Industries, Ltd.)

50 % of the weight Glycerol 5 % of the weight Diethylene glycol 15 % of the weight The surfactant of the above-mentioned general formula (10) 1 % of the weight Sodium dehydroacetate (antifungal agent) 0.4 % of the weight 2-pyrrolidone Residue [0335] Each recording ink of yellow, a Magenta, cyanogen, and black was adjusted like example 51 example 33. Moreover, stirring mixing of the following constituent was carried out, and the pretreatment liquid of a recorded material was produced, and it adjusted by triethanolamine so that pH might be set to 7. The viscosity in this case was described in Table 5.

[Pretreatment liquid 34 of a recorded material]

Q105-H (Hymo Corp. dicyandiamide resin) 20 % of the weight Glycerol 10 % of the weight SAMPAKKU AP (San-Ai Oil antifungal agent) 0.4 % of the weight Surfactant of the above-mentioned general formula (11) 2 % of the weight Ion exchange water Residue [0336] Below, 1-8 were evaluated like examples 26-33 about the recording ink of the 44 to example 51 above-mentioned publication, and the pretreatment liquid of a recorded material, and the obtained result was described in Table 5.

[0337] except for not using the pretreatment liquid of example of comparison 40 recorded material -- an example 44 -- the same -- carrying out -- 1- 5 and 7 were examined.

[0338] except for not using the pretreatment liquid of example of comparison 41 recorded material -- an example 45 -- the same -- carrying out -- 1- 5 and 7 were examined.

[0339] except for not using the pretreatment liquid of example of comparison 42 recorded material -- an example 46 -- the same -- carrying out -- 1- 5 and 7 were examined.

[0340] except for not using the pretreatment liquid of example of comparison 43 recorded material -- an example 47 -- the same -- carrying out -- 1- 5 and 7 were examined.

[0341] except for not using the pretreatment liquid of example of comparison 44 recorded material -- an example 48 -- the same -- carrying out -- 1- 5 and 7 were examined.

[0342] except for not using the pretreatment liquid of example of comparison 45 recorded material -- an example 49 -- the same -- carrying out -- 1- 5 and 7 were examined.

[0343] except for not using the pretreatment liquid of example of comparison 46 recorded material -- an example 50 -- the same -- carrying out -- 1- 5 and 7 were examined.

[0344] except for not using the pretreatment liquid of example of comparison 47 recorded material -- an example 51 -- the same -- carrying out -- 1- 5 and 7 were examined.

[0345] After filling up the recording head using the PZT piezoelectric device as a driving source with the pretreatment liquid 32 of the recorded material used in the example of comparison 48 example 49 and injecting it to a recorded material, the same recording head which prepared the recording ink of each color of an example 49 apart from pretreatment liquid was filled up, respectively, it injected to the recorded material, and 1-8 were examined. The pretreatment liquid of a recorded material was injected into the part of the recorded material with which the recording ink of each color is injected. However, the regurgitation of the recording head filled up with pretreatment liquid was

not carried out.

[0346] Instead of the pretreatment liquid 32 of the recorded material used in the example 48 of example of comparison 49 comparison, 1-8 were examined like the example 48 of a comparison except having used the pretreatment liquid 35 of a recorded material. The viscosity of this liquid was described in Table 5.

[Pretreatment liquid 35 of a recorded material]

Cello pole YM-500 (dicyandiamide resin by Sanyo Chemical Industries, Ltd.)

2 % of the weight Glycerol 10 % of the weight SAMPAKKU AP (San-Ai Oil antifungal agent) 0.4 % of the weight Surfactant of the above-mentioned general formula (6) 1 % of the weight Ion exchange water The regurgitation of the recording head filled up with pretreatment liquid was not carried out like the example 48 of a residue comparison.

[0347] Instead of the pretreatment liquid 32 of the recorded material used in the example 48 of example of comparison 50 comparison, 1-8 were examined like the example 48 of a comparison except having used the pretreatment liquid 36 of a recorded material. The viscosity of this liquid was described in Table 5.

[Pretreatment liquid 36 of a recorded material]

SANFIKKUSU 70 (dicyandiamide resin by Sanyo Chemical Industries, Ltd.)

1 % of the weight Glycerol 10 % of the weight SAMPAKKU AP (San-Ai Oil antifungal agent) 0.4 % of the weight Surfactant of the above-mentioned general formula (7) 1 % of the weight Ion exchange water Residue [0348] Above-mentioned 1-above-mentioned 7 were examined to the following record medium using each recording ink of a publication, and the pretreatment liquid of a recorded material in the example 52 - example 61 example 49. The test result was described in Table 5.

Example 52: Xerox Corp. make; Xerox paper R (whenever [size] 8s, 20s of air permeability)

Example 53: AUSTRALIAN The product made from PAPER (Australia); REFLEX (whenever [size] 25s, 4s of air permeability)

Example 54: NBS Ricoh Co., Ltd. make; NBS facsimile-posting form 90K (whenever [size] 60s, 68s of air permeability)

Example 55: Canon company make ;P B form (whenever [size] 21s, 8s of air permeability)

Example 56: NBS Ricoh Co., Ltd. make; NBS facsimile-posting form 45K (whenever [size] 11s, 45s of air permeability)

Example 57: ; by Honshu Paper Co., Ltd., and ***** (whenever [size] 12s, 21s of air permeability)

Example 58: Ricoh Co., Ltd. make; **** PPC form type S (whenever [size] 22s, 13s of air permeability)

Example 59: Xerox Corp. make ;P Paper (whenever [size] 24s, 19s of air permeability)

Example 60: Xerox Corp. make; multi-ace (whenever [size] 25s, 17s of air permeability)

Example 61: Xerox Corp. make; Xerox 4024 paper (whenever [size] 32s, 21s of air permeability)

[0349]

[Table 5]

表 5

	被記録材の前処理液粘度	被記録材の前処理液付着量	1) 画像濃度	2) 色境界にじみ	3) フェザリング	4) 色調	5) 表抜け	6) カール、コクリング*	7) 耐水性	8) 前処理液保存性
実施例44	500	8	○	○	○	○	○	○	○	○
実施例45	300	2	◎	◎	◎	○	◎	○	◎	○
実施例46	800	6	◎	◎	◎	◎	◎	○	◎	○
実施例47	600	3	◎	◎	◎	◎	◎	◎	○	○
実施例48	400	2	◎	◎	◎	◎	◎	◎	◎	○
実施例49	200	3	◎	◎	◎	◎	◎	○	◎	○
実施例50	200	2	◎	◎	◎	◎	◎	◎	◎	○
実施例51	100	4	◎	◎	◎	◎	○	○	◎	○
比較例40	—	—	×	×	×	○	×	—	×	—
比較例41	—	—	○	△	○	×	△	—	○	—
比較例42	—	—	○	△	×	○	△	—	×	—
比較例43	—	—	○	△	×	○	×	—	×	—
比較例44	—	—	○	△	×	○	×	—	×	—
比較例45	—	—	○	△	×	○	×	—	×	—
比較例46	—	—	○	△	×	○	×	—	×	—
比較例47	—	—	○	△	×	○	×	—	×	—
比較例48	200	被記録材の前処理液 不吐出								
比較例49	10	被記録材の前処理液 不吐出								
比較例50	5	15	○	△	×	○	×	×	○	○
実施例52	200	3	◎	◎	◎	◎	◎	○	◎	○
実施例53	200	3	◎	◎	◎	◎	◎	○	◎	○
実施例54	200	3	◎	◎	◎	◎	◎	○	◎	○
実施例55	200	3	◎	◎	◎	◎	◎	○	◎	○
実施例56	200	3	◎	◎	◎	◎	◎	○	◎	○
実施例57	200	3	◎	◎	◎	◎	◎	○	◎	○
実施例58	200	3	◎	◎	◎	◎	◎	○	◎	○
実施例59	200	3	◎	◎	◎	◎	◎	○	◎	○
実施例60	200	3	◎	◎	◎	◎	◎	○	◎	○
実施例61	200	3	◎	◎	◎	◎	◎	○	◎	○

[Effect of the Invention] As mentioned above, the pretreatment liquid used by the image recording approach of this invention as explained Since hyperviscous pretreatment liquid is given to a recorded material rather than the liquid used in order that the compound to which the solubility of recording ink and dispersibility are made to fall may contain in high concentration, can breathe out conventional liquid and may give in total, As compared with the approach of giving conventional pretreatment liquid by the ink jet record approach, the effectiveness of preventing the strike-through of a color boundary blot, a feather ring, and recording ink is large, and image concentration and a color tone improve, since liquid is hyperviscosity especially -- pretreatment liquid -- the interior of recorded materials, such as a regular paper, -- since until osmosis is not carried out deeply but it remains near the front face of a recorded material, as compared with the approach of breathing out conventional liquid and giving in total, the effectiveness of the above-mentioned image upgrading is acquired, and since there are few amounts of liquid grants, it is hard to produce the cock ring of a recorded material, also when there are few amounts of grants of the pretreatment liquid per unit area, Furthermore, by using anionic recording ink and the pretreatment liquid of cationic this invention, the strike-through prevention effectiveness of recording ink can increase, and image quality can be raised more. Thus, if the image recording approach of this invention and pretreatment liquid are used, double-sided printing good with a regular paper will be attained. Moreover, since grant means, such as a roller, can give a recorded material, equipment can be simple and the pretreatment liquid of this invention can be manufactured cheaply. With it, with such a grant means, the amount of grants of pretreatment liquid is made few, and a running cost can be reduced.

[Translation done.]